大话移动通信

丁奇　阳桢◎著

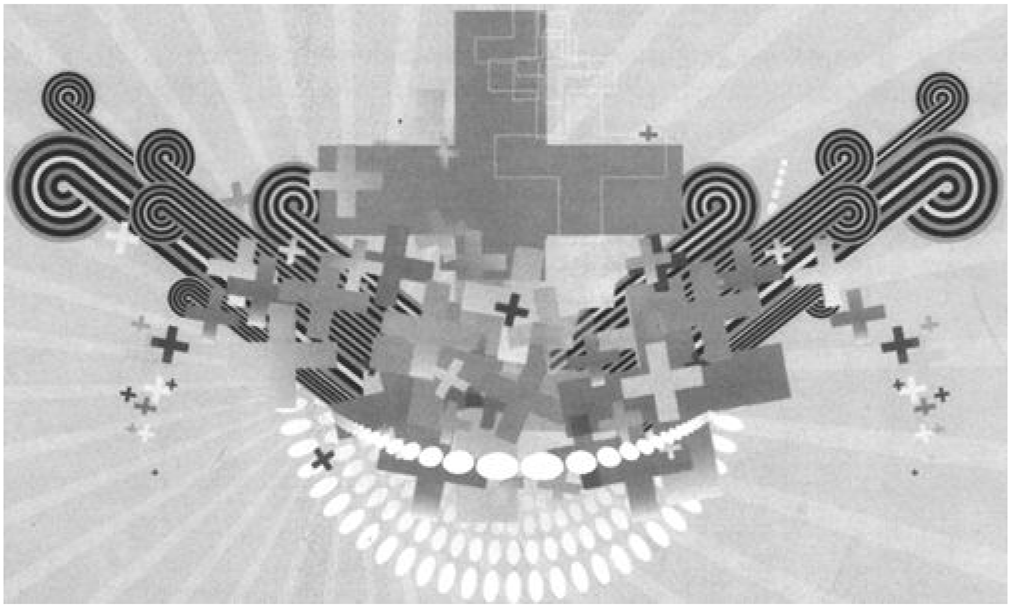


- 畅销书《大话无线通信》作者丁奇精心编著的又一力作，为您奉上阅读盛宴
- 内容涵盖2G、3G、LTE和4G，与《大话无线通信》相比，更为浅显、全面
- 秉承《大话无线通信》一书轻松幽默的写作风格，让您真正体会“快乐学习”

人民邮电出版社
POSTS & TELECOM PRESS

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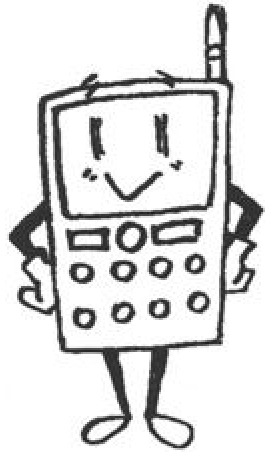
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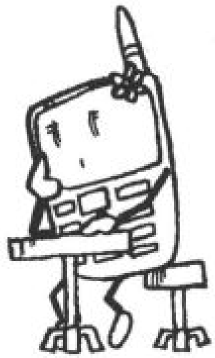
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Chapter 1
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[illegible]“[illegible]”[illegible]……

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[illegible]“[illegible]”[illegible]CRC[illegible]Cyclic Redundancy Check[illegible]——“[illegible]”[illegible]

[illegible]

[illegible]——[illegible]“[illegible]”[illegible]“1”[illegible]“0”[illegible]1[illegible]

[illegible]——“[illegible]”[illegible]“[illegible]”[illegible]BTS[illegible]BSC[illegible]“[illegible]”[illegible]

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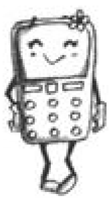
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[illegible]

[illegible]“[illegible]”[illegible]

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[illegible]1887[illegible]——[illegible]1895[illegible]

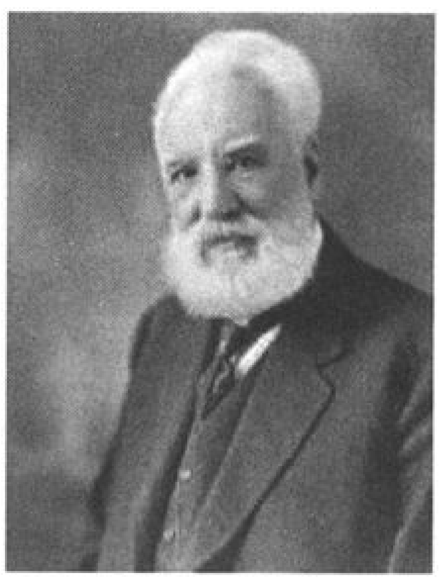
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12[illegible]1844[illegible]



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[illegible]1854[illegible]6[illegible]

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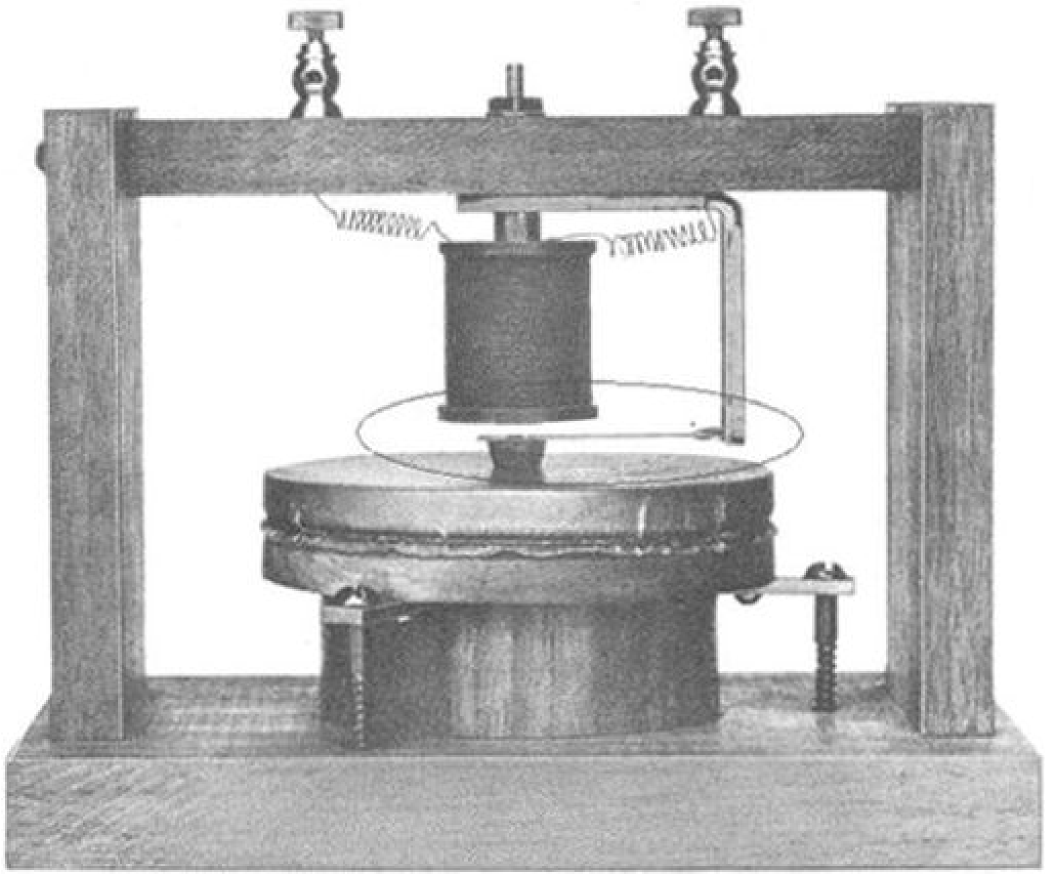
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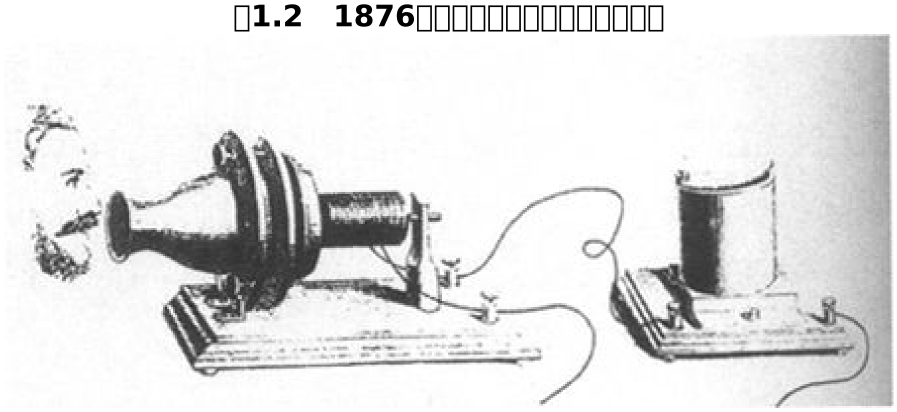
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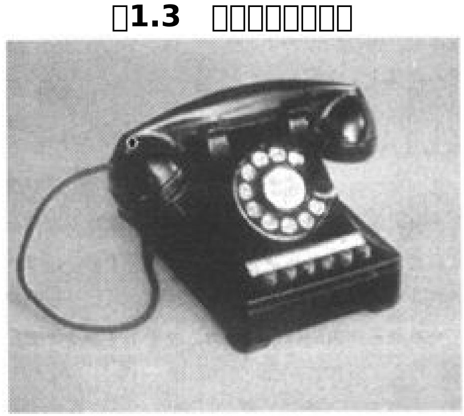
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[illegible]1.2   1876[illegible]



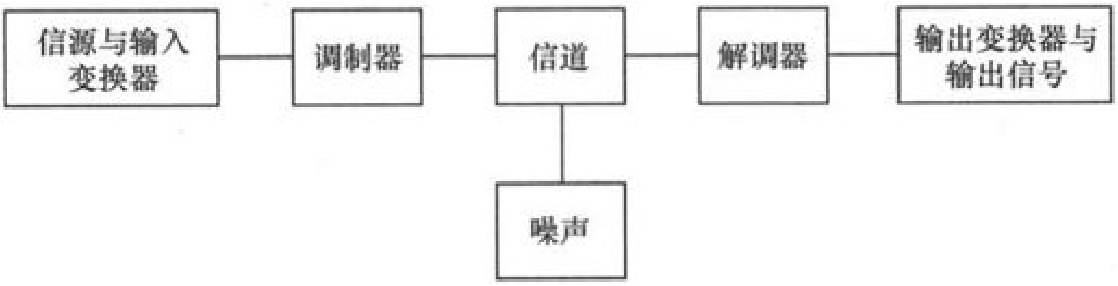
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1.2.2







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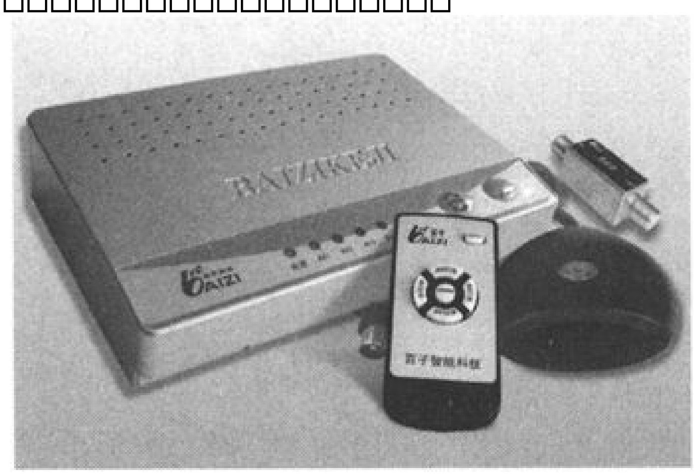
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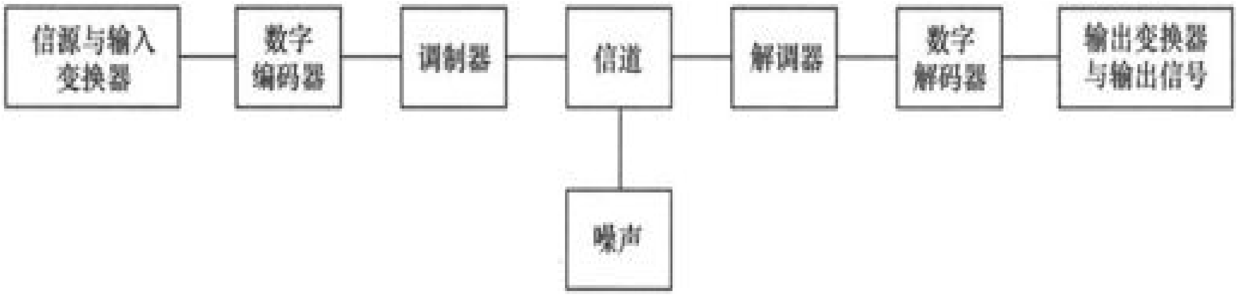
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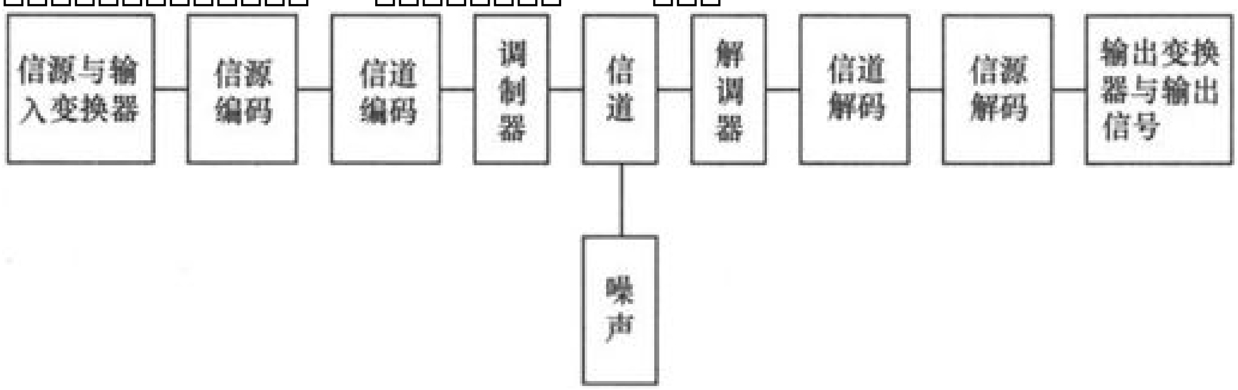


[illegible]1.8 [illegible]

[illegible]“[illegible]—[illegible]”[illegible]“[illegible]”[illegible]1.9[illegible]


信源与输入
变换器
数字
编码器
调制器
信道
解调器
数字
解码器
输出变换器
与输出信号
噪声

1.9


信源与输
入变换器
信源
编码
信道
编码
调
制
器
信
道
解
调
器
信道
解码
信源
解码
输出变换
器与输出
信号
噪
声

1.10

1.2.4

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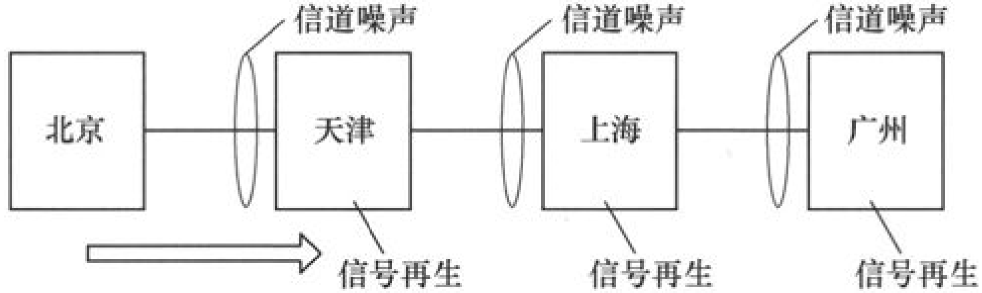
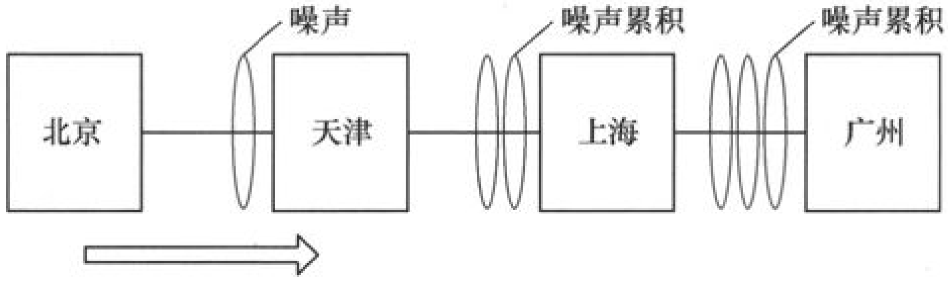


图 1.11　数字信号的消噪处理



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1.3　“□□□□”□□□□□——□□□□

□□□□“□□□□”□□GSM□□WCDMA□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□“□□—□□”□□

1.3.1　□□□□——□□□□□□□

[illegible]“[illegible]”[illegible]——“[illegible]‘[illegible]’[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

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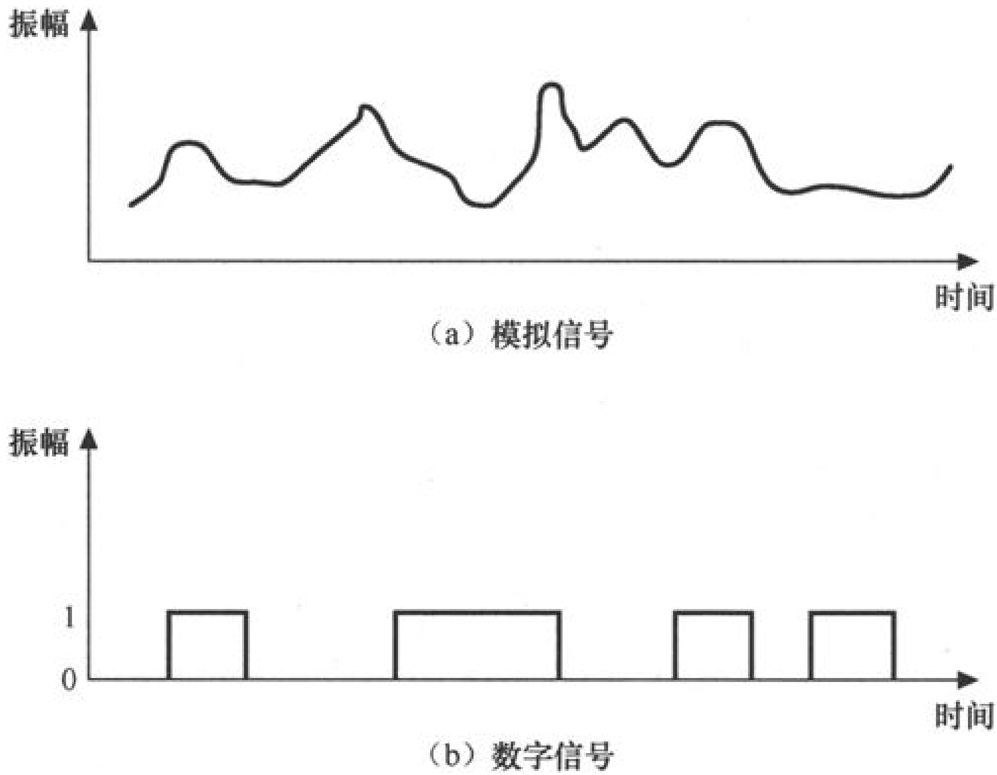
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[illegible]

1.3.2 [illegible]

[illegible]

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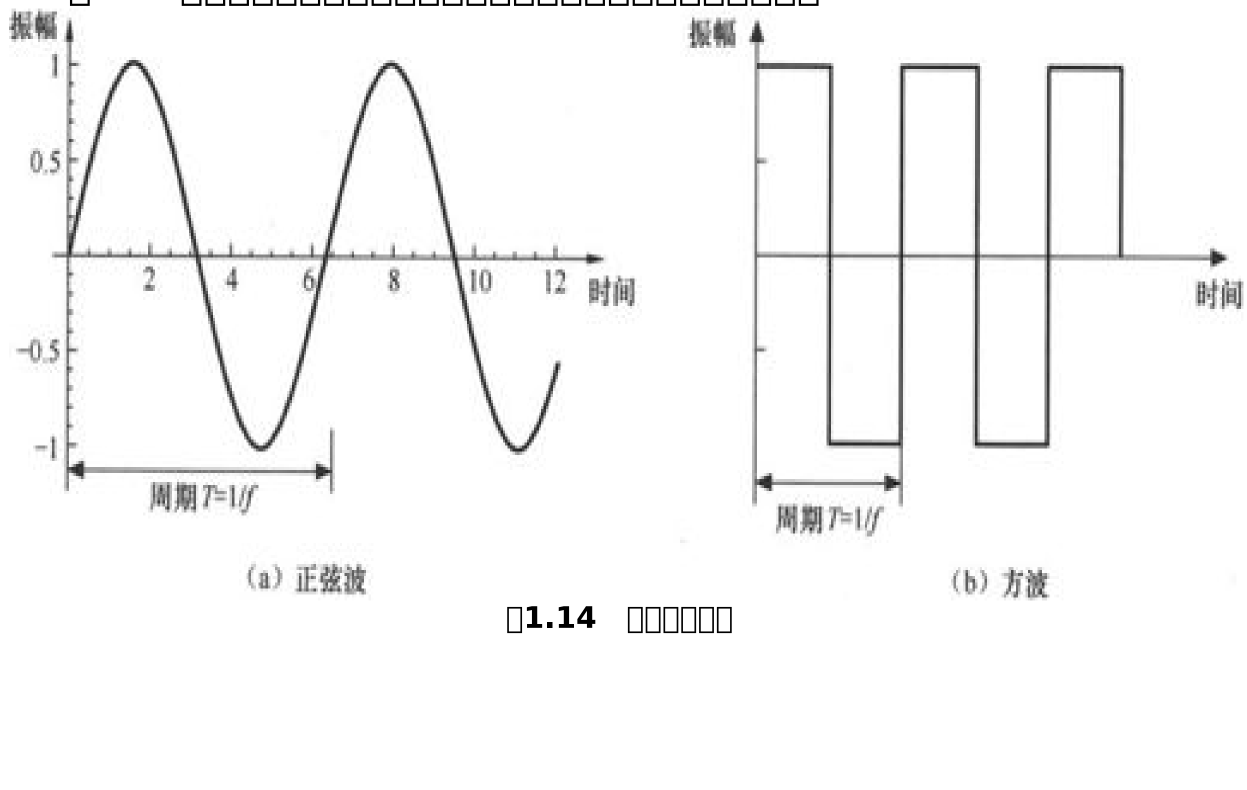


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[illegible]“[illegible]”[illegible]

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[illegible]1.14[illegible]



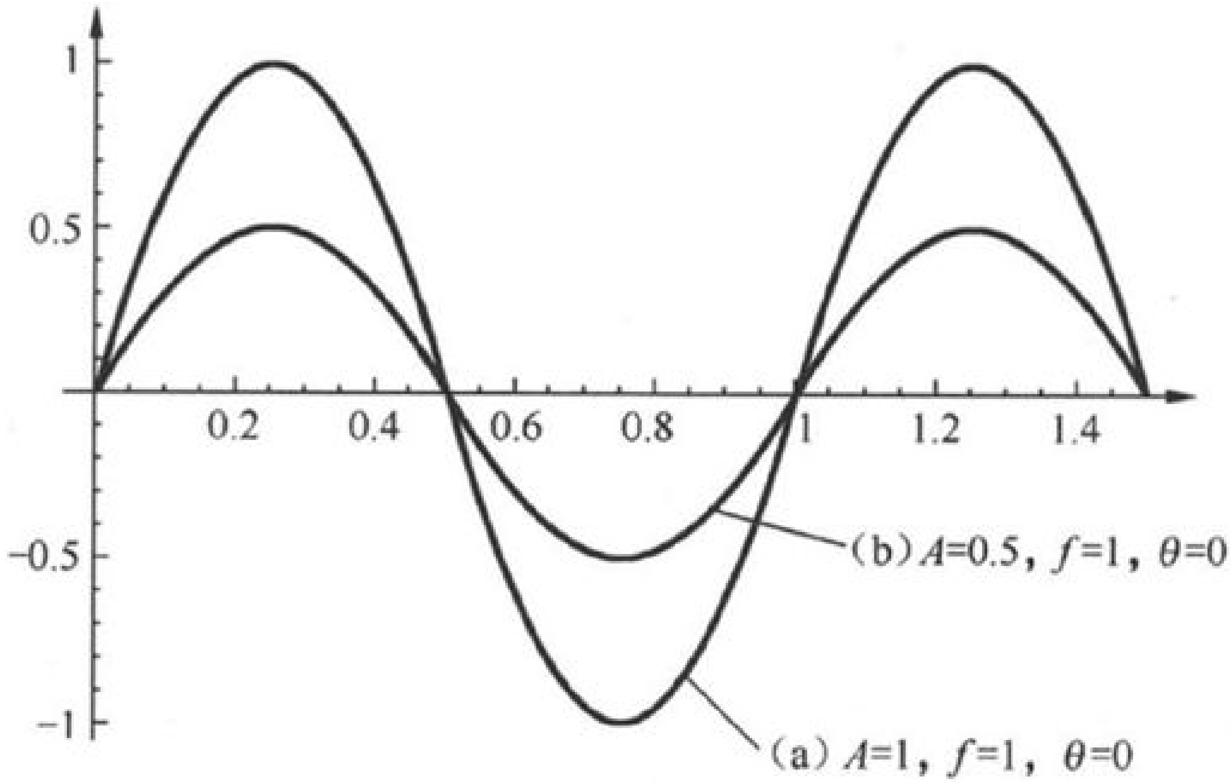
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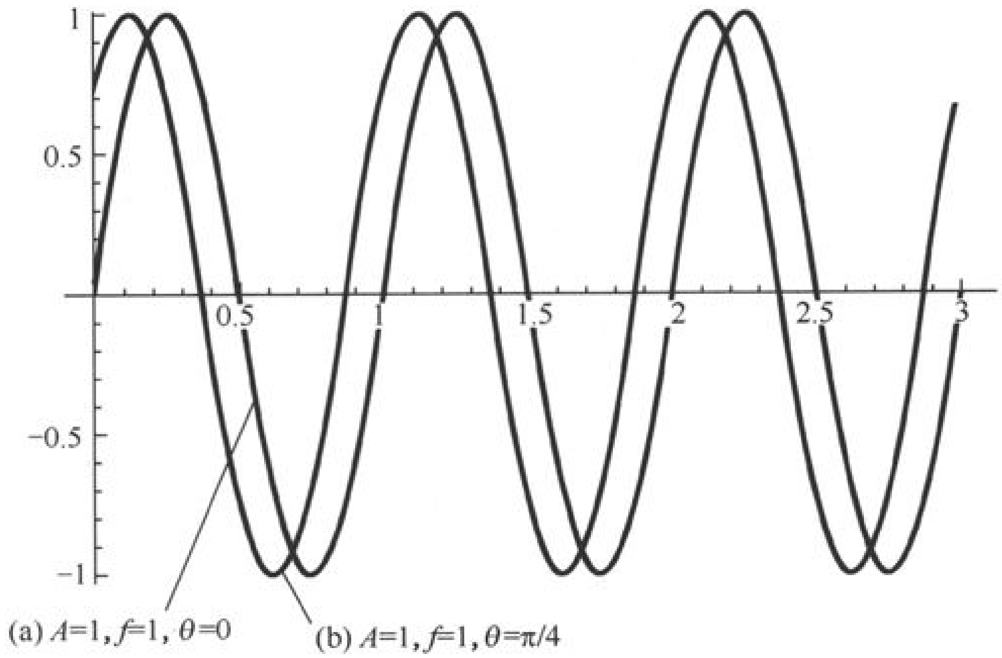
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$$S□t□□Asin□2\pi ft□\theta□$$

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□1.15 □□□S□t□□Asin□2πft□θ□□□□□



□1.16 □□□S□t□□Asin□2πft□θ□□□□□

1.3.3 □□□□□□□

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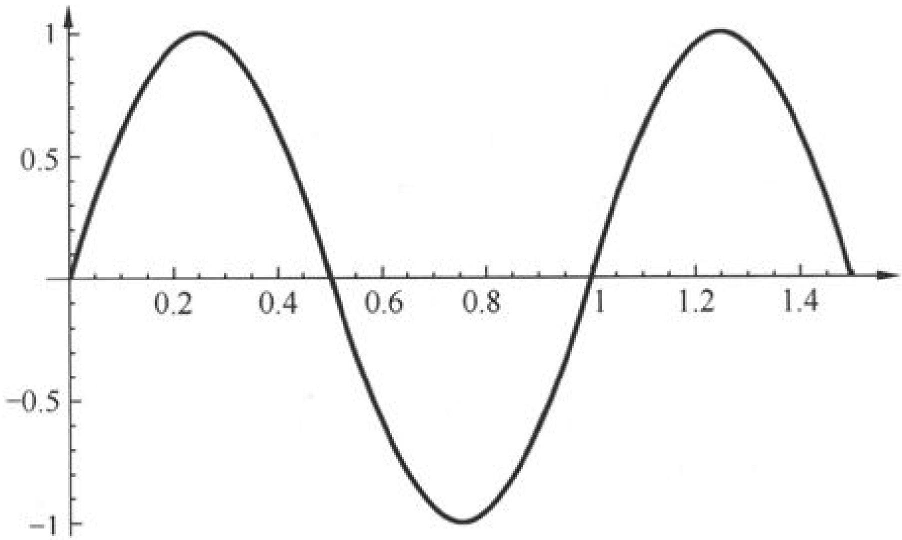
□□□1.3.2□□

$$S(t) = \sin(2\pi ft)+(1/2)\sin[2\pi(3f)t]$$

□□□□□□□□□□f□□□3f□□□□□1.17□□

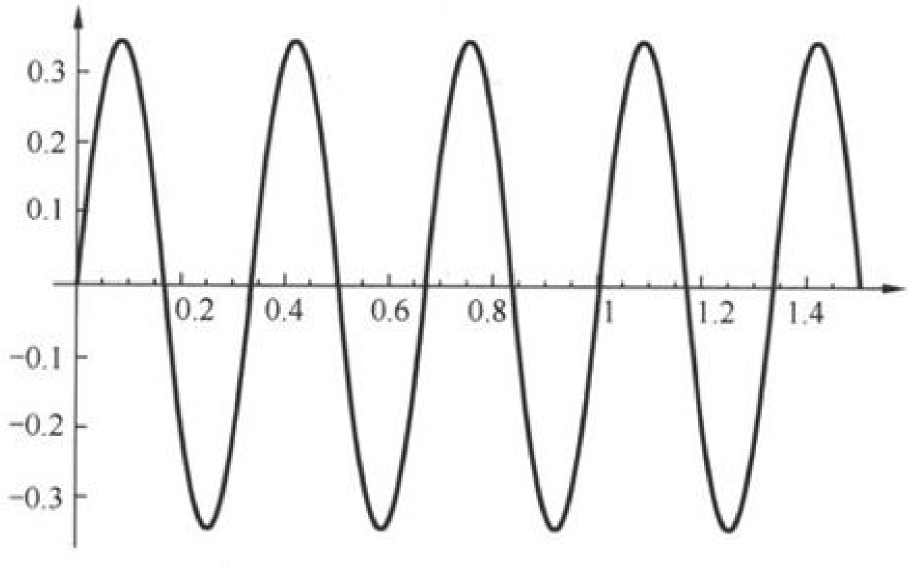
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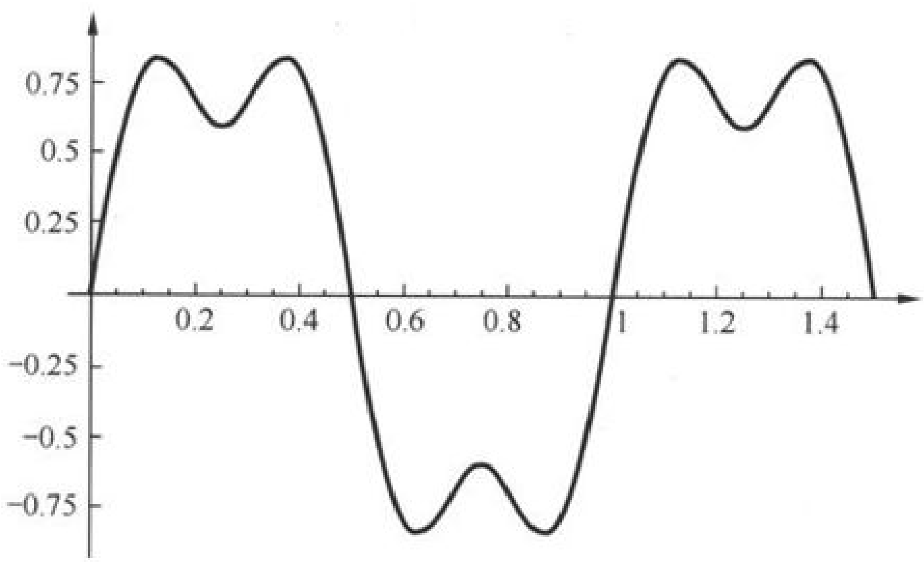


（a）$\sin(2\pi ft)$

[illegible]1.17 [illegible]T[illegible]1/f[illegible]



（b）(1/2) sin [2π (3f) t]

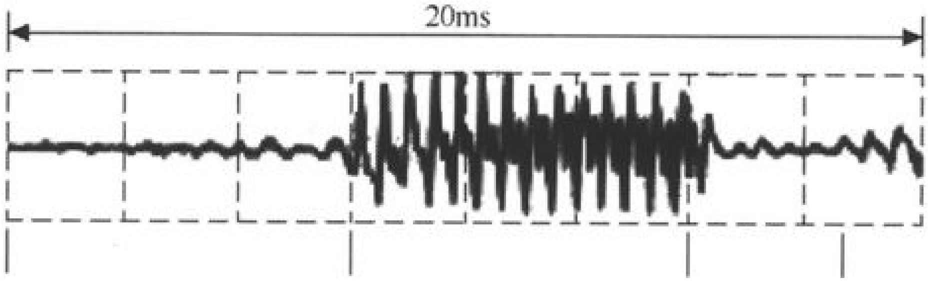


（c）S (t)=sin (2πft)+(1/2) sin [2π (3f) t]

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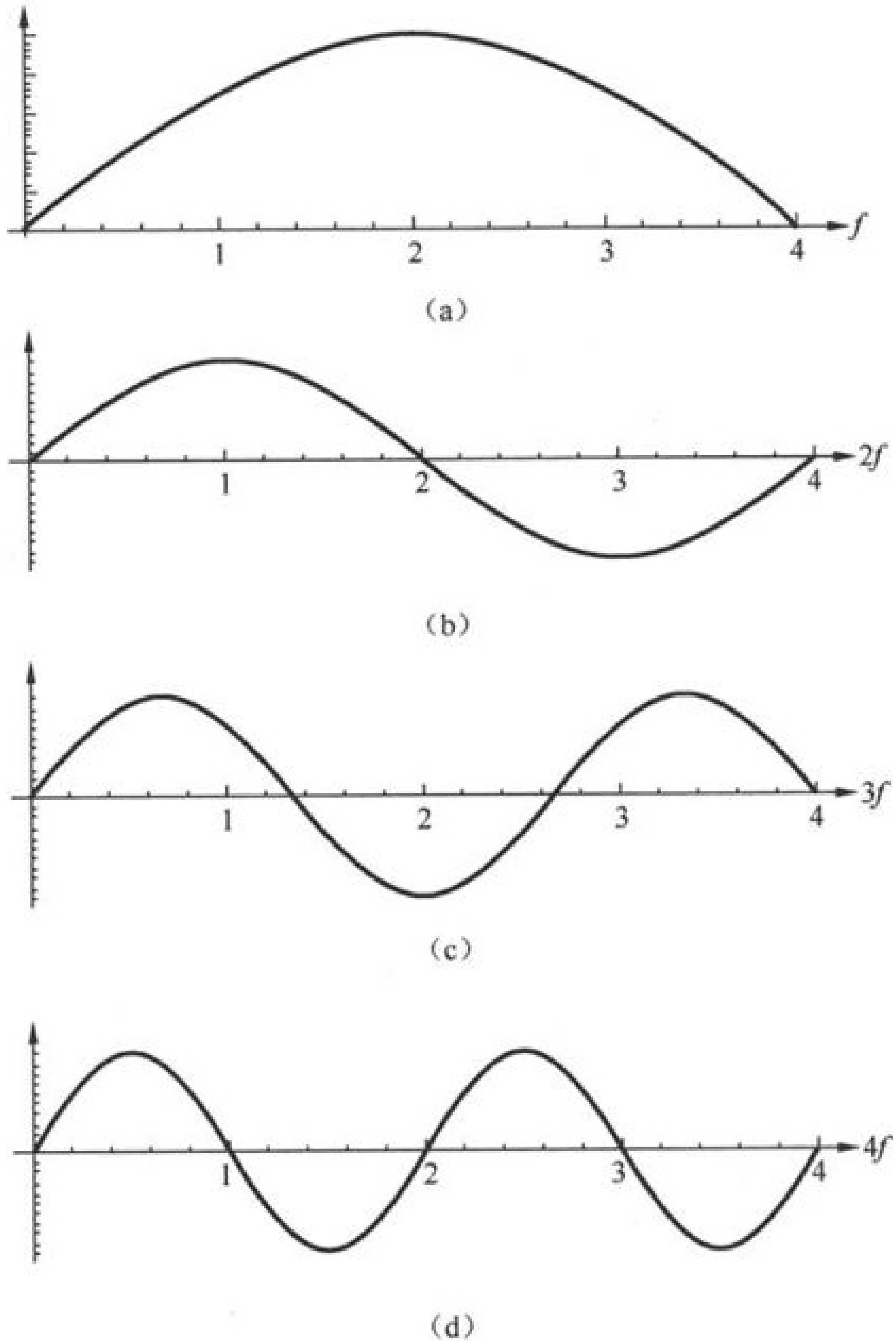
1.4 “[illegible]”[illegible]——[illegible]

[illegible]1.18[illegible]



□1.18 20ms□□□□□

□1.18□□□□20ms□□□□□□□□□□□□□□□□□□□□□20ms□□□□□□□□□□
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[illegible]**1.19** [illegible]

[illegible]

[illegible]1748[illegible]1.19[illegible]

1.4.1 [illegible]

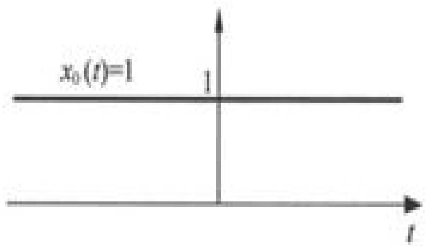
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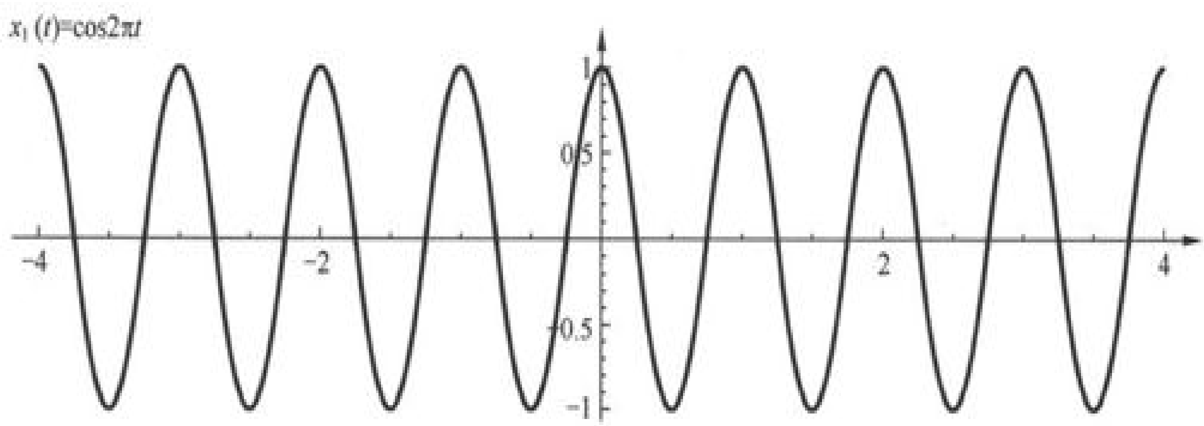
[illegible]x[illegible]

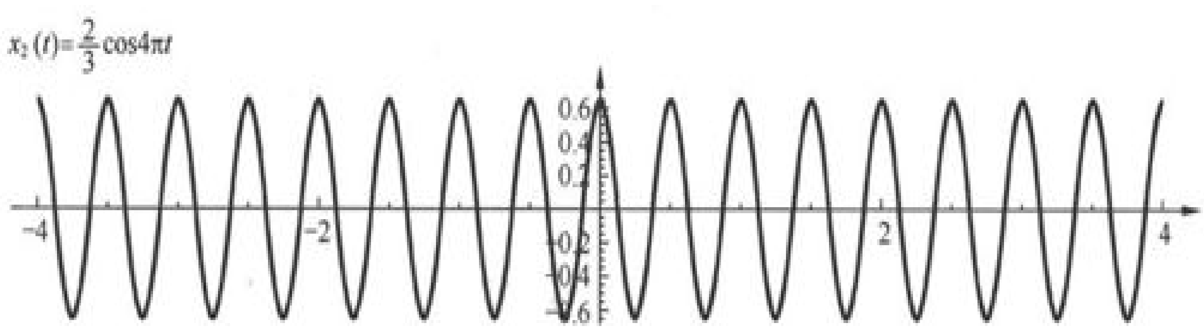
[illegible]1.20[illegible]

1753[illegible]

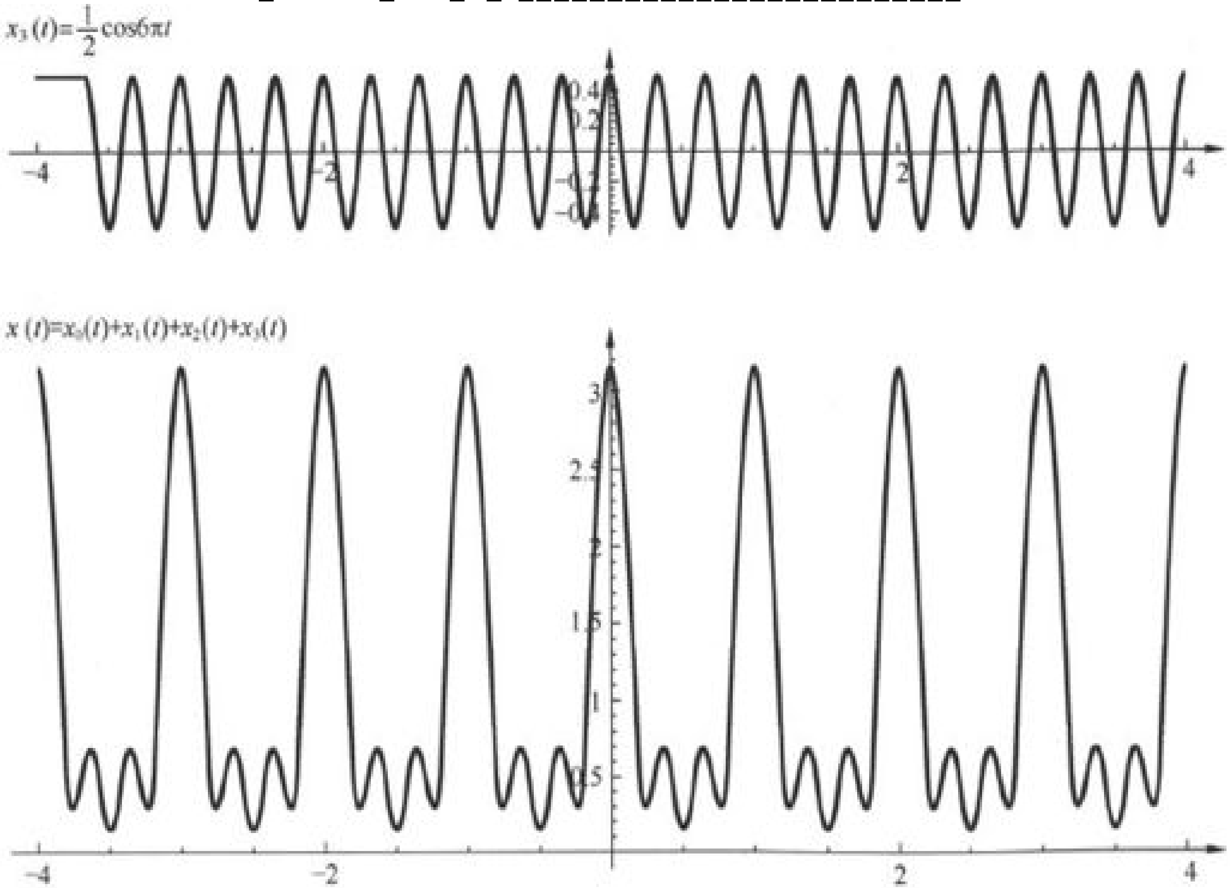
1759[illegible]







[illegible]1.20 [illegible]1.1[illegible]x[illegible]t[illegible]



[illegible]1.20 [illegible]1.1[illegible]x[illegible]t[illegible]

[illegible]1807[illegible]“[illegible]”[illegible]

[illegible]

[illegible]

1.4.2 [illegible]——[illegible]

[illegible]t[illegible]T[illegible]

$$x(t) = x(t + T) \tag{1.1}$$

[illegible]

$$x(t) = e^{j\omega_0 t} = \cos\omega_0 t + j\sin\omega_0 t \tag{1.2}$$

[illegible]ω_0[illegible]T[illegible]$2\pi/\omega_0$[illegible]k[illegible]1.2[illegible]

□□□

$$\phi_k(t) = \mathrm{e}^{\mathrm{j}k\omega_0 t} = \mathrm{e}^{\mathrm{j}k(2\pi/T)t} \qquad k = 0,\ \pm 1,\ \pm 2,\cdots \tag{1.3}$$

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$$x(t) = \sum_{k=-\infty}^{+\infty} a_k \mathrm{e}^{\mathrm{j}k\omega_0 t} = \sum_{k=-\infty}^{+\infty} a_k \mathrm{e}^{\mathrm{j}k(2\pi/T)t} \tag{1.4}$$

□□□□□a_k□□□□□□□□□□□□□$\mathrm{e}^{\mathrm{j}k\omega_0 t}$□□□□□□□□□□□□k□0□□□□□□□□□□□k□+1□k□-1□□□□□□□□□□□□ω_0□□□□□□□□□□□□□□□□□□□□□□k□+2□k□-2□□□□□□□□□□□□□□□□□□□□□1/2□□□□□□□□□□2□□□□□□□□□□□□□□□□□□k□+N□k□-N□□□□□N□□□□□□□□□□□□□□□□□1.4□□□□□□□□□□□□□

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$$x(t) = \sum_{k=-3}^{+3} a_k \mathrm{e}^{\mathrm{j}k2\pi t} \tag{1.5}$$

□□a_0□1□a_1□a_{-1}□1/2□a_2□a_{-2}□1/3□a_3□a_{-3}□1/4□

□□□□□1.5□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

$$x(t) = 1 + \frac{1}{2}(\mathrm{e}^{\mathrm{j}2\pi t} + \mathrm{e}^{-\mathrm{j}2\pi t}) + \frac{1}{3}(\mathrm{e}^{\mathrm{j}4\pi t} + \mathrm{e}^{-\mathrm{j}4\pi t}) + \frac{1}{4}(\mathrm{e}^{\mathrm{j}6\pi t} + \mathrm{e}^{-\mathrm{j}6\pi t})$$

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$$x(t) = 1 + \cos 2\pi t + \frac{2}{3}\cos 4\pi t + \frac{1}{2}\cos 6\pi t$$

$$x_0(t) = 1$$

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[illegible]1[illegible]3[illegible]x[illegible]t[illegible]1.5[illegible]

$$x(t)=\sum_{k=-\infty}^{+\infty}a_k e^{jk\omega_0 t}=\sum_{k=-\infty}^{+\infty}a_k e^{jk(2\pi/T)t} \qquad (1.6)$$

$$a_k=\frac{1}{T}\int_T x(t)e^{-jk\omega_0 t}dt=\frac{1}{T}\int_T x(t)e^{-jk(2\pi/T)t}dt \qquad (1.7)$$

[illegible]1.6[illegible]1.7[illegible]a_k[illegible]x[illegible]t[illegible]x[illegible]t[illegible]x[illegible]t[illegible]a_0[illegible]x[illegible]t[illegible]

[illegible]1.18[illegible]

1.4.3 [illegible]——[illegible]

[illegible]

[illegible]1.6[illegible]T[illegible]2π/T[illegible]

[illegible]1[illegible]3[illegible]

[illegible]

$$x(t)=\frac{1}{2\pi}\int_{-\infty}^{+\infty}X(j\omega)e^{j\omega t}d\omega \qquad (1.8)$$

$$X(j\omega)=\int_{-\infty}^{+\infty}x(t)e^{-j\omega t}dt \qquad (1.9)$$

[illegible]1.8[illegible]1.9[illegible]X[illegible]jω[illegible]x[illegible]t[illegible]1.8[illegible]1.6[illegible]1.8[illegible]1.7[illegible]1.9[illegible]

[illegible]

[illegible]“[illegible]—[illegible]”[illegible]

[illegible]4[illegible]3[illegible]5[illegible]……[illegible]1.21[illegible]

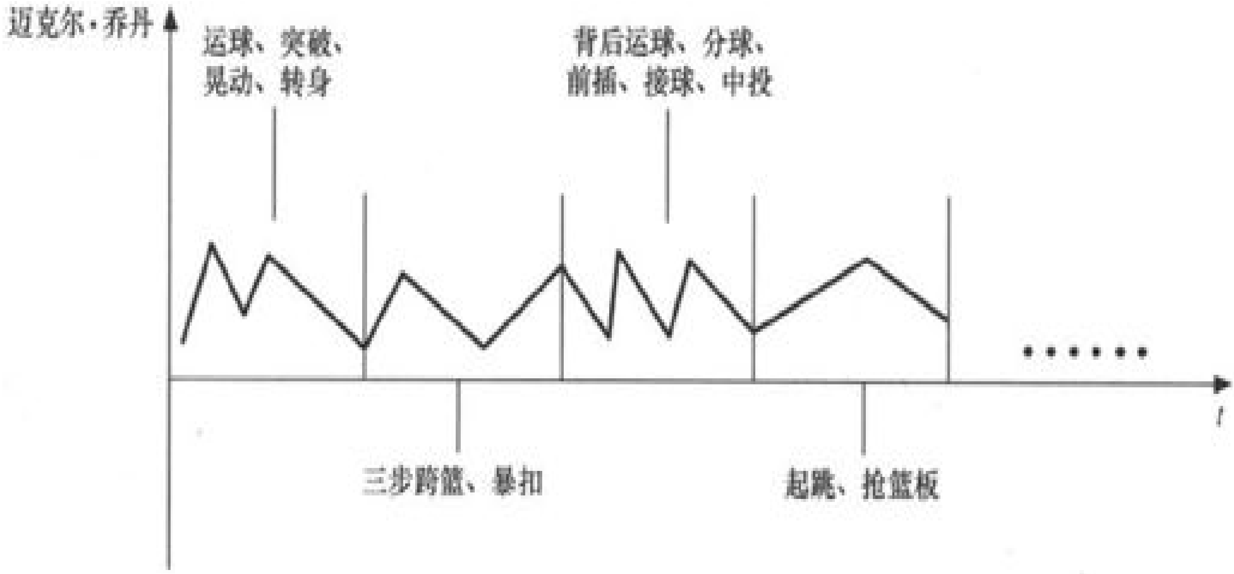
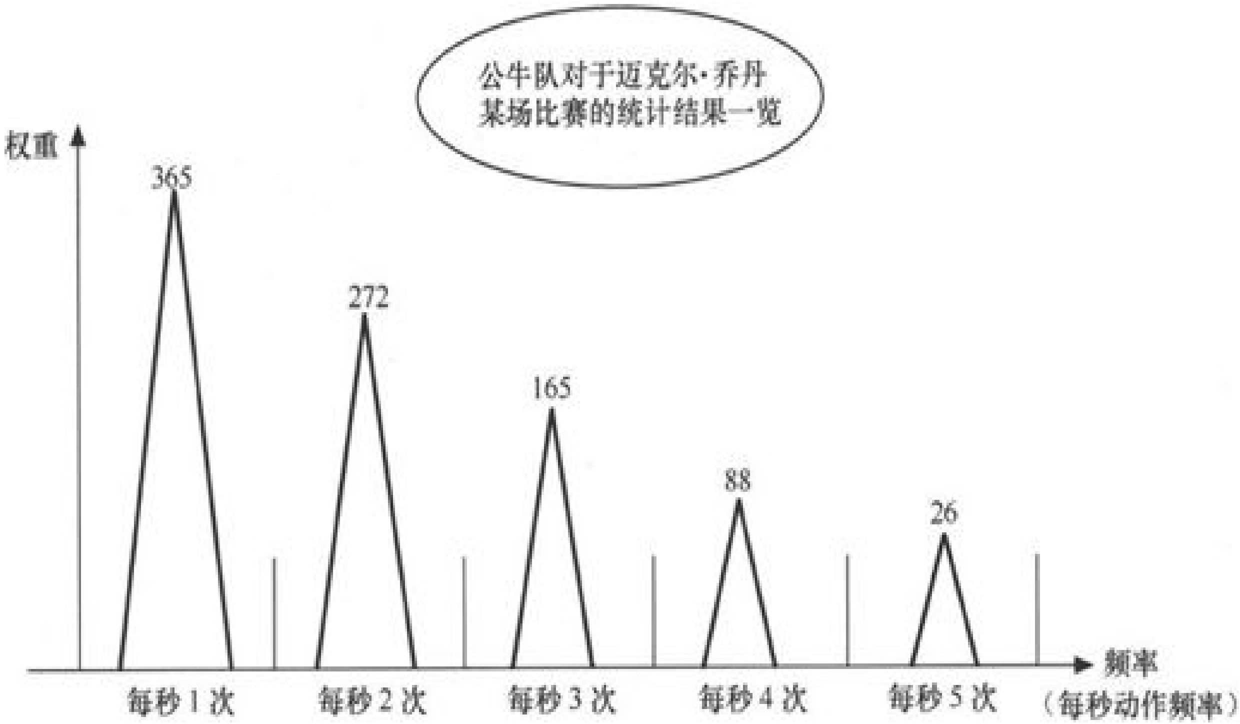


图1.21 [illegible]·[illegible]

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[illegible]·[illegible]1.22[illegible]



[illegible]**1.22** [illegible]·[illegible]

[illegible]1.22[illegible]

[illegible]

[illegible]

1.5 “[illegible]”[illegible]——[illegible]

[illegible]GSM[illegible]WCDMA[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

1.5.1 [illegible]——[illegible]

1.4[illegible]1.18[illegible]20ms[illegible]“0”[illegible]“1”[illegible]

[illegible]y[illegible]sinx[illegible]

[illegible]0[illegible]0[illegible]π/6[illegible]1/2[illegible]π/4[illegible]$\sqrt{2}$/2[illegible]

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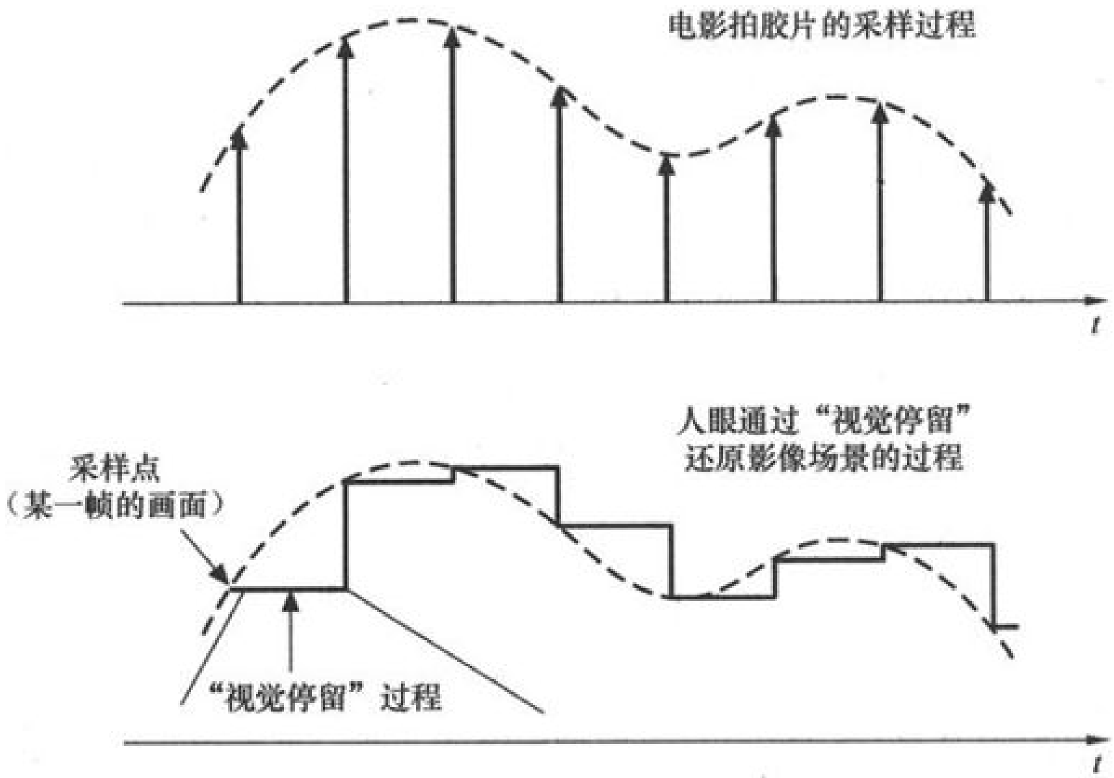
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[illegible]24[illegible]24[illegible]“[illegible]”[illegible]“[illegible]”[illegible]1.23[illegible]“[illegible]”[illegible]



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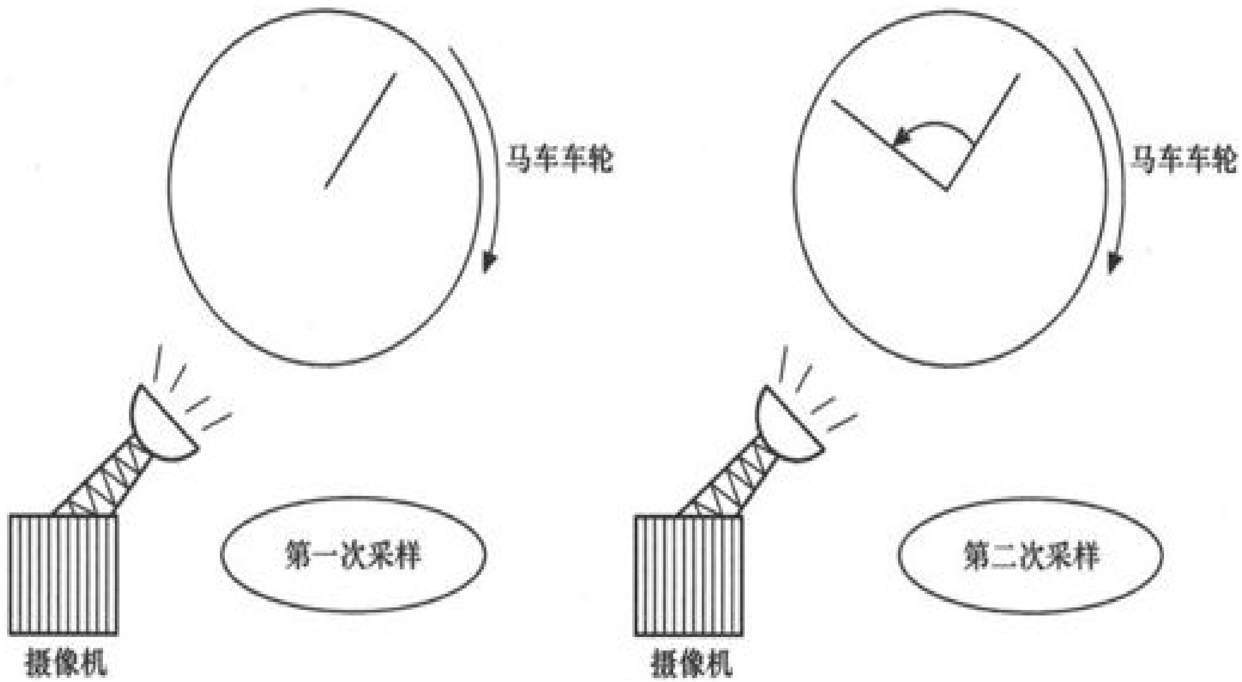
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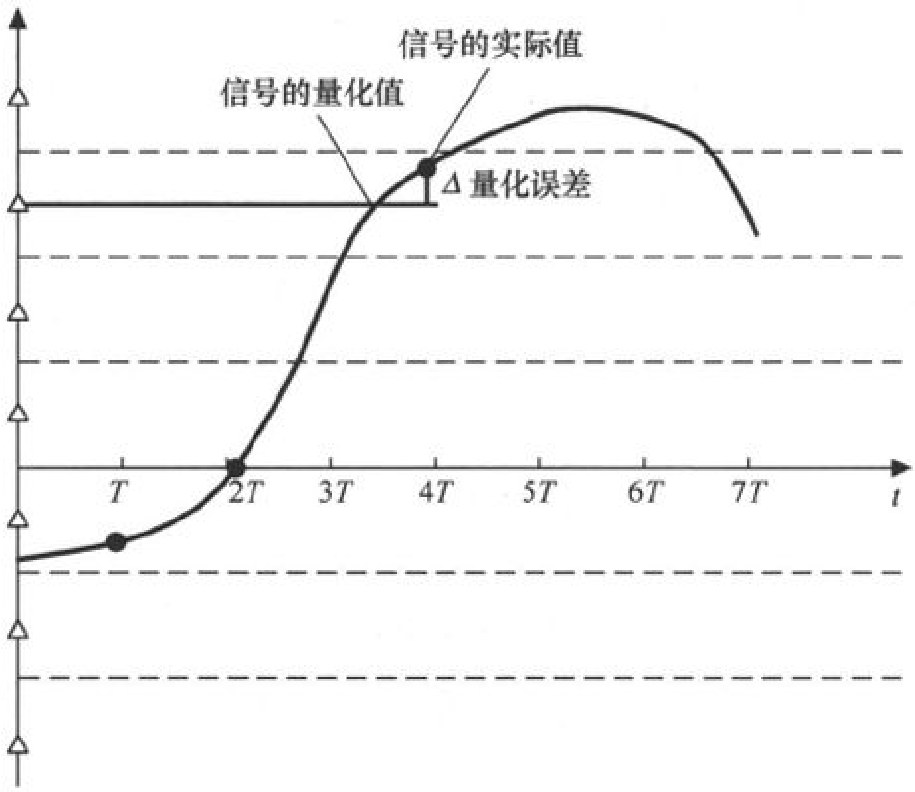
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$$\Delta v = \frac{b-a}{M}$$

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$$\left(\frac{S_0}{N_0}\right)_{dB} = 10\lg\left(\frac{0.81}{0.16}\right) \approx 7dB$$

□□□□□□9.9□□□10□□□□□□□□□□□9.5□□□□□□□□S_0□□9.9□^{2}□98.01□□□□□□□N_0□□9.9□9.5□^{2}□0.16□□□□□□□□□□□□□

$$\left(\frac{S_0}{N_0}\right)_{dB} = 10\lg\left(\frac{98.01}{0.16}\right) \approx 27dB$$

□□□

□□x□□□□□□□y□□y□f□x□□□□□□□□□□□□□□y□□□□□□□□□

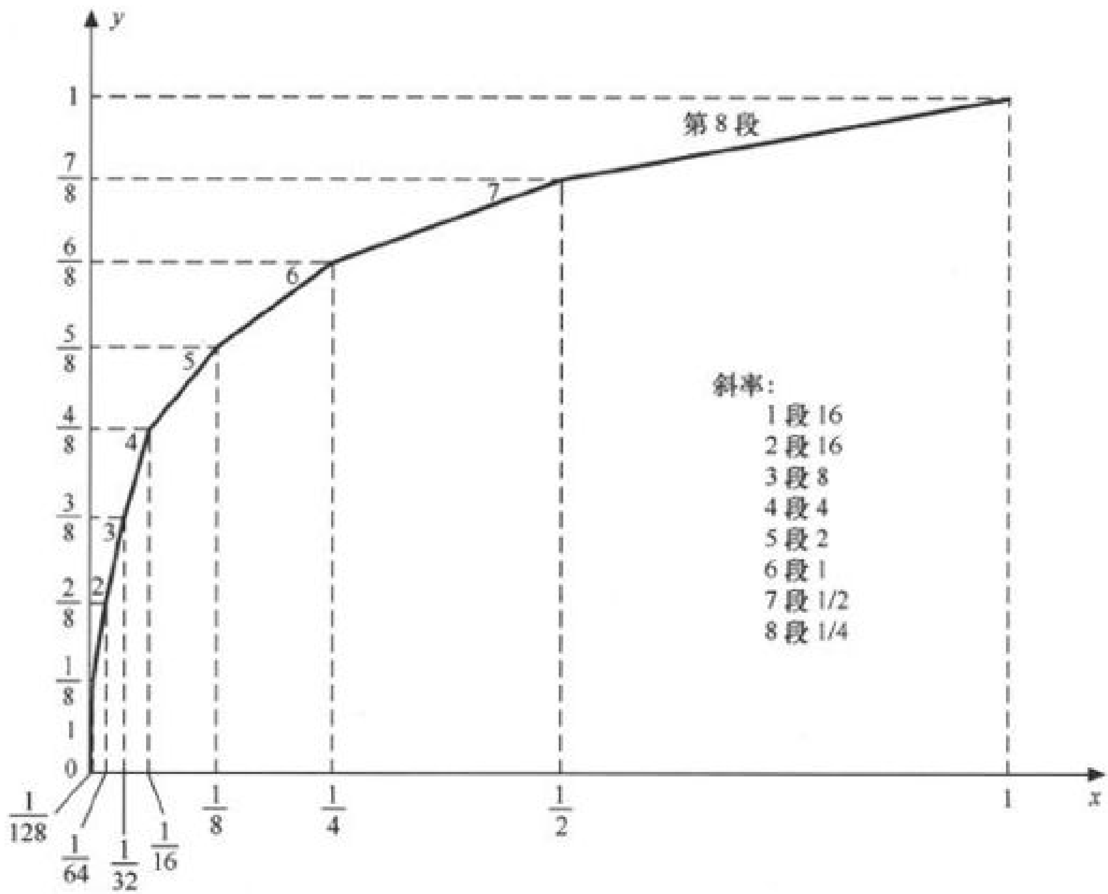
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$$y = \frac{Ax}{1+\ln A}\ ,\ 0 < x \leqslant \frac{1}{A}$$

□□x□□□□□□□□□□□□y□□□□□□□□□□□A□□□□□□□□□□□□□□□□□□□A□87.6□

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[illegible]1.26[illegible]y[illegible]x[illegible]x[illegible]y[illegible]x[illegible]

[illegible]

1.5.3 [illegible]——[illegible]

[illegible]No[illegible]

[illegible]

[illegible]“I love you”[illegible]“je t'aime[illegible]je t'adore”[illegible]“Ich liebe dich”[illegible]“Tiamo”[illegible]PCM[illegible]ΔM[illegible]DPCM[illegible]

[illegible]

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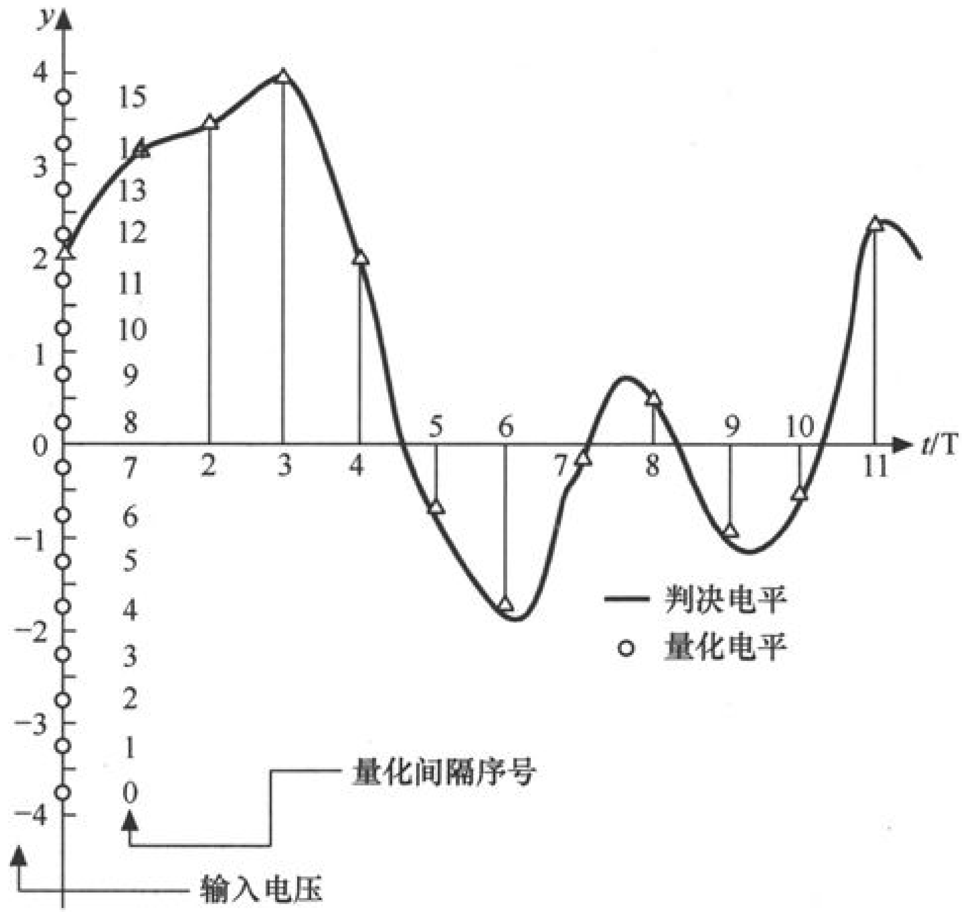
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□1.27□□□16□□□□□□□□□□□□0.5V□□□□□□□□□□□□□□-4V□-3.5V□…□3.5V□4V□16□□□□□□□□-3.75V□-3.25V□…□3.25V□3.75V□□1.27□□□12□□□□□□□□□□□□□□□□□□□1.1□□□□



□1.27 PCM□□□□□

□1.1 PCM□□□□□

采样时间	6T	5T	7T	8T	4T	0T	1T	2T	3T
采样值	−1.76	−0.75	−0.2	0.4	1.9	2.1	3.2	3.4	3.9
量化电平	−1.75	−0.75	−0.25	0.25	1.75	2.25	3.25	3.25	3.75
二进制编码	0100	0110	0111	1000	1011	1100	1110	1110	1111

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2□DPCM□□□□□□□□

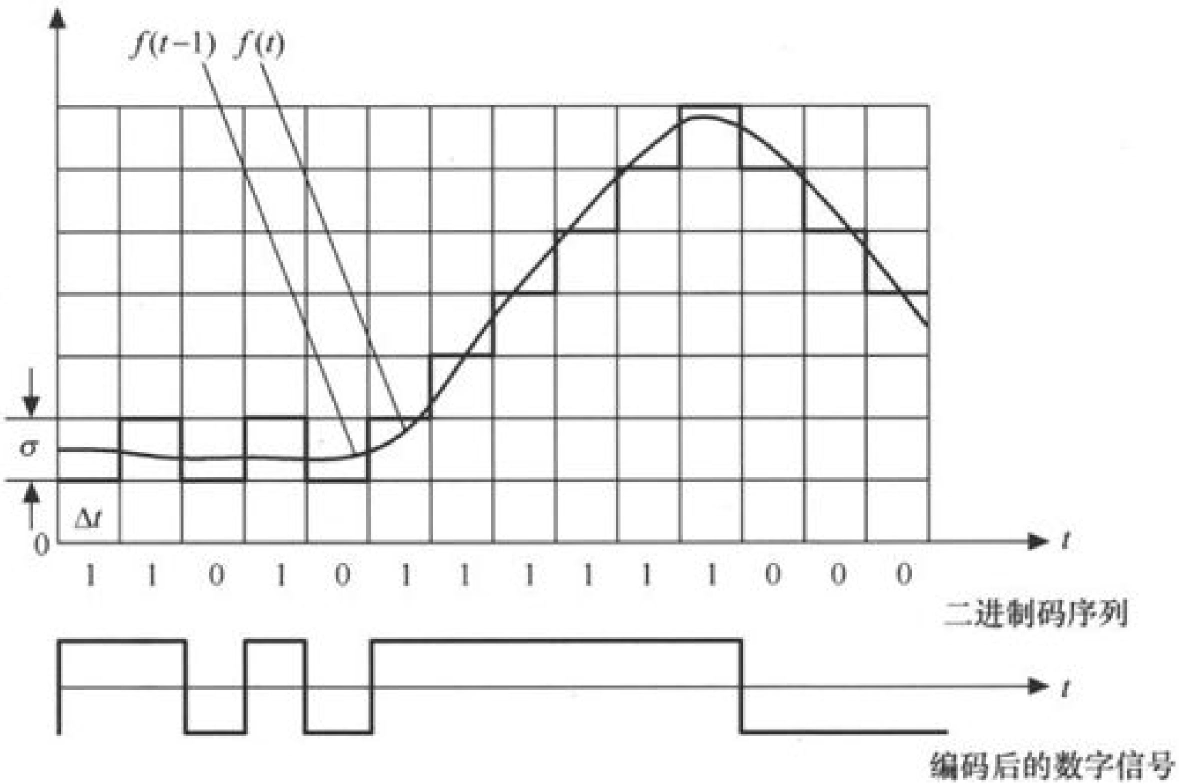
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[illegible]“0”[illegible]“1”[illegible]“1”[illegible]“0”[illegible]“[illegible]”[illegible]

[illegible]

[illegible]3[illegible]

[illegible]1[illegible]

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[illegible]3bit[illegible]2^3[illegible]8[illegible]bit[illegible]2^2[illegible]4[illegible]

$$\begin{cases} 000 = 风 \\ 011 = 雨 \\ 101 = 雷 \\ 110 = 电 \end{cases}$$

[illegible]“000”[illegible]“011”[illegible]“101”[illegible]“110”[illegible]

[illegible]“000”[illegible]“001”[illegible]“010”[illegible]1[illegible]“100”[illegible]“110”[illegible]1[illegible]“101”[illegible]

[illegible]

$$\begin{cases}000=风\\111=电\end{cases}$$

[illegible]1[illegible]“100”[illegible]000[illegible]“111”[illegible]“100”[illegible]

[illegible]

1.5.4 [illegible]——[illegible]

[illegible]1.2[illegible]GSM[illegible]200[illegible]3400Hz[illegible]900MHz[illegible]WCDMA[illegible]2100MHz[illegible]

[illegible]4kHz[illegible]4kHz[illegible]900MHz[illegible]

[illegible]1[illegible]10Hz[illegible]20kHz[illegible]

[illegible]2[illegible]1/4[illegible]4kHz[illegible]

[illegible]3×10^8m/s[illegible]/4000[illegible]s[illegible]×1/4[illegible]18750[illegible]m[illegible]

[illegible]3[illegible]AMPS[illegible]GSM[illegible]PHS[illegible]CDMA[illegible]WCDMA[illegible]cdma2000[illegible]TD-SCDMA[illegible]2100MHz[illegible]

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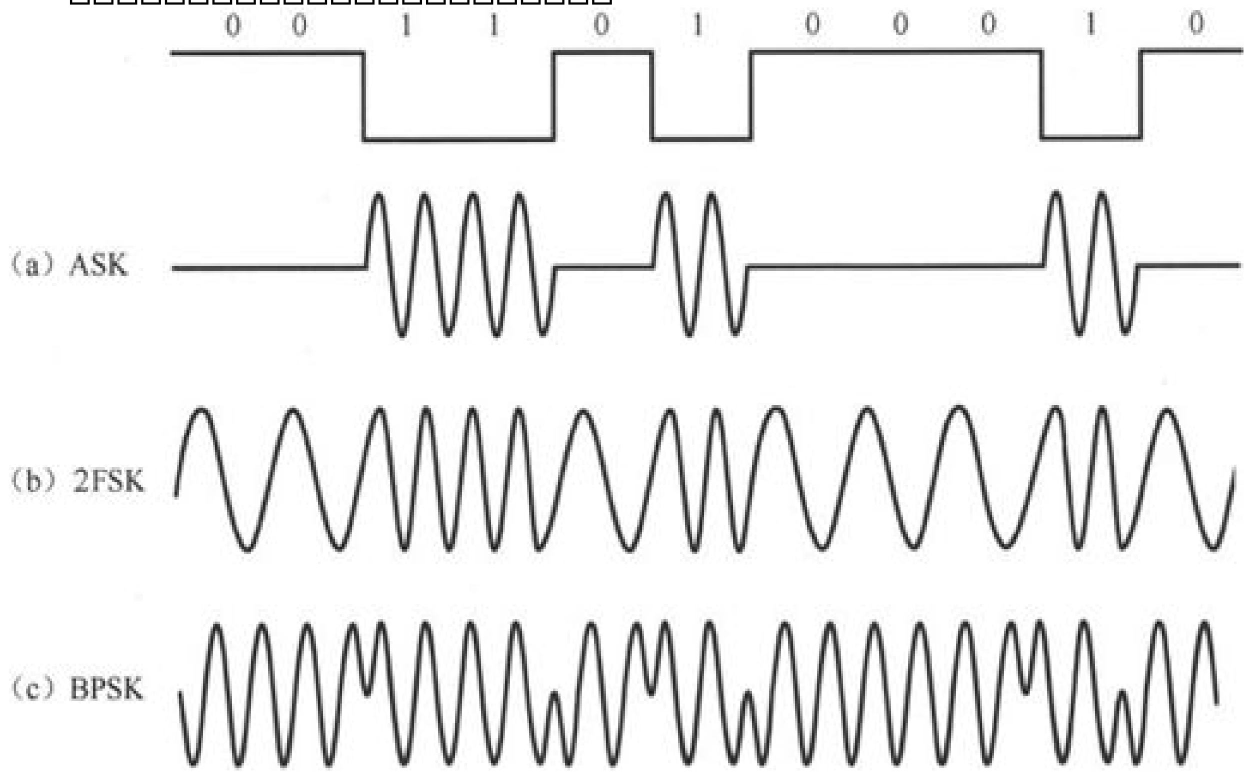
1□□□□□□ASK□

□□“0”□“1”□□□□□□□□□□ASK□□□□□□□□□□□0□□□□□□□□□“0”□□□□□□□□□□□□□□□□□□□□1□□□1.29□a□□□□□□□□□□□□□□□□□□□

$$\text{ASK}\quad s(t)=\begin{cases}A\cos(2\pi f_c t) & \text{二进制数1}\\ 0 & \text{二进制数0}\end{cases}$$

□□□□□□□□□Acos□$2\pi f_c t$□□

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2□□□□□□FSK□

GSM□□□□□□□□MSK□□FSK□□□□□

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$$\text{2FSK} \qquad s(t)=\begin{cases} A\cos(2\pi f_1 t) & \text{二进制数1} \\ A\cos(2\pi f_2 t) & \text{二进制数0} \end{cases}$$

2FSK□□□□□□□ASK□□

3□□□□□□PSK□

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$$\text{BPSK} \qquad s(t)=\begin{cases} A\cos(2\pi f_c t+0) & = \; A\cos(2\pi f_c t) \\ A\cos(2\pi f_c t+\pi) & = -A\cos(2\pi f_c t) \end{cases}$$

□□180°□□□□□□□□□□□□-1□□□□□□□□□

4□□□□□□□QAM□

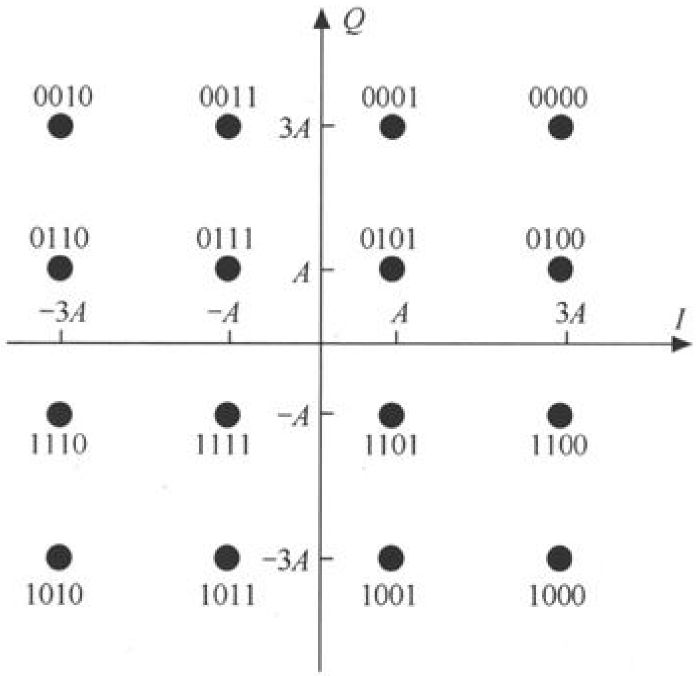
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MQAM□□□□□□□□□□□□□□□□

$$S_{\text{QAM}}(t)=A_i\cos(\theta_i)\cos 2\pi f_c t + A_i\sin(\theta_i)\cos 2\pi f_c t \qquad (i=1,2,\cdots,M;\; 0\leqslant t\leqslant T)$$

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□1.30 16QAM□□□

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□□□Channel Capacity□□□□□□□□□□□□□□□

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□3□□□□noise□□

□4□□□□□error rate□□□□□□□□□□□□□□□□“0”□□□□□“1”□□□□□□□“1”□□□□□□“0”□

1.6.1 □□□□□□□——□□□□□□

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1.6.2 □□□□□□□——□□□□

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□□□SNR□Signal-to-Noise Ratio□□SNR□□□□□□□□□□S□□□□□□□□□□N□□□□□SNR□S/N□

□□

$$C = B \operatorname{lb}\left(1+\frac{S}{N}\right)$$

[illegible]N[illegible]B[illegible]no[illegible]N[illegible]n_0B[illegible]

$$C = B \operatorname{lb}\left(1+\frac{S}{n_0 B}\right)$$

[illegible]B[illegible]C[illegible]B[illegible]C[illegible]

$$C = B \operatorname{lb}\left(1+\frac{S}{n_0 B}\right) = \frac{S}{n_0} \times \frac{n_0 B}{S} \operatorname{lb}\left(1+\frac{S}{n_0 B}\right)$$

[illegible]B→∞[illegible]

$$\lim_{B\to\infty} C = \lim_{B\to\infty}\left[\frac{n_0 B}{S}\operatorname{lb}\left(1+\frac{S}{n_0 B}\right)\right]\left(\frac{S}{n_0}\right) = \operatorname{lb} e\left(\frac{S}{n_0}\right) \approx 1.44\frac{S}{n_0}$$

[illegible] $\frac{S}{n_0}$ [illegible]B→∞[illegible]C[illegible]B→∞[illegible]N[illegible]

[illegible]

[illegible]

1.6.3 [illegible]——[illegible]

[illegible]

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[illegible]

[illegible]

[illegible] d [illegible] Friis [illegible]

$$P_r(d) = \frac{P_t G_t G_r \lambda^2}{(4\pi)^2 d^2 L}$$

[illegible] P_t [illegible] P_r [illegible] d [illegible] G_t [illegible] G_r [illegible] d [illegible] m [illegible] L [illegible] $L \geq 1$ [illegible] λ [illegible] m [illegible] A_e [illegible]

$$G = \frac{4\pi A_e}{\lambda^2}$$

[illegible] 20dB/10 [illegible]

[illegible]

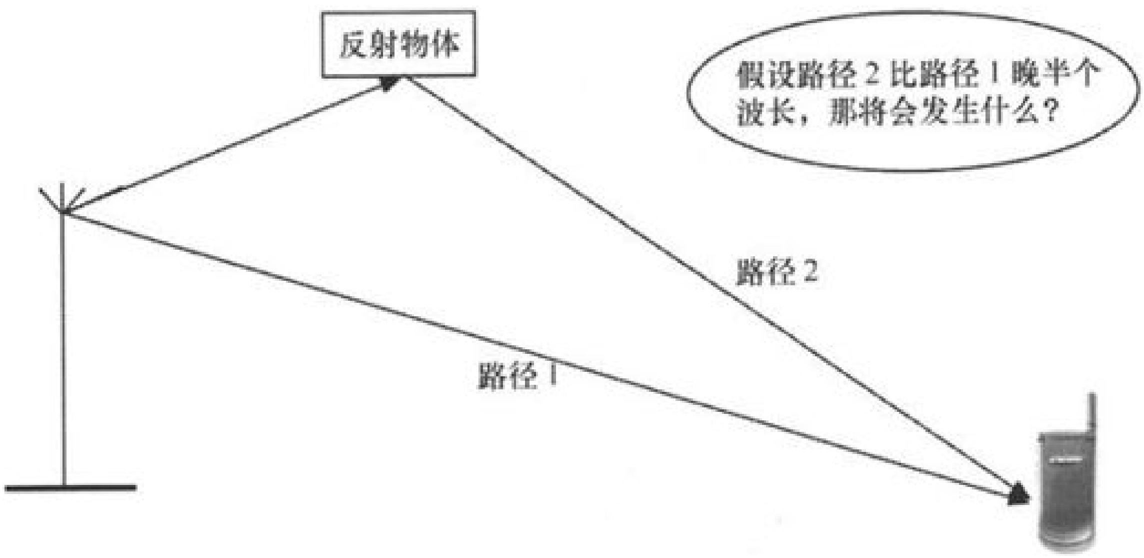
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1.6.4 [illegible]——[illegible]

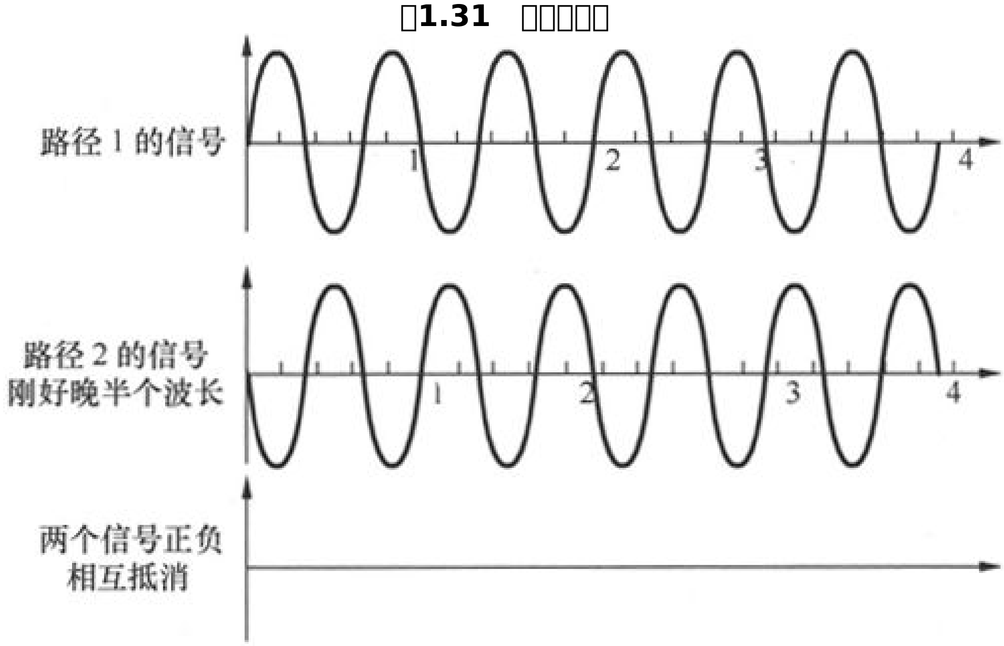
[illegible] 3 [illegible] 4 [illegible] 30dB [illegible] 40dB [illegible]

[illegible] 6 [illegible] 5 [illegible]

[illegible] 1.31 [illegible] Rician [illegible] LOS [illegible] 1.32 [illegible]

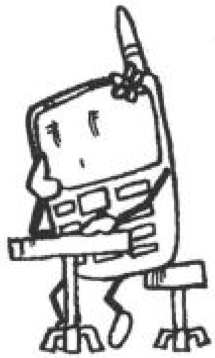

反射物体
假设路径 2 比路径 1 晚半个
波长，那将会发生什么？
路径 2
路径 1

□1.31　□□□□□


路径 1 的信号
1
2
3
4
路径 2 的信号
刚好晚半个波长
1
2
3
4
两个信号正负
相互抵消

□1.32　□□□□□□□□□□□□

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Chapter 2
[illegible]



[illegible]3[illegible]WCDMA[illegible]

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2.1 [illegible]——[illegible]

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[illegible]“[illegible]”[illegible]“[illegible]”[illegible]1940[illegible]

[illegible]1940[illegible]

2.1.1 [illegible]

[illegible]1940[illegible]Theodore S.Rappaort[illegible]Harri Holma[illegible]UMTS for WCDMA[illegible]

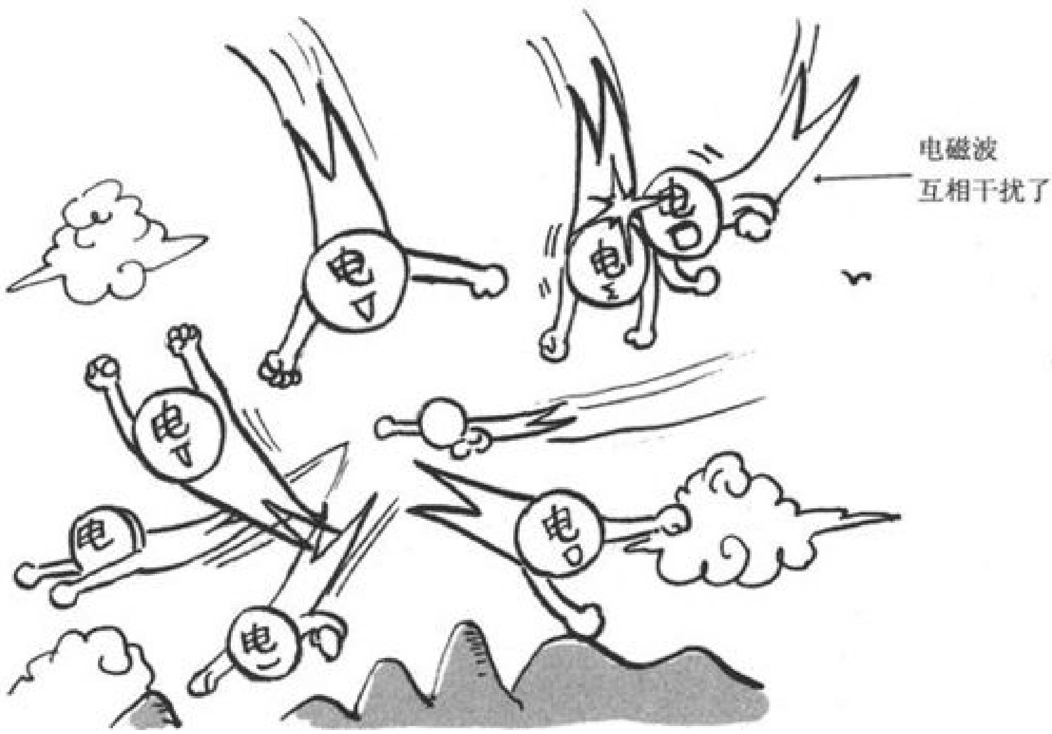




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[illegible]2.3[illegible]20[illegible]3400Hz[illegible]20kHz[illegible]



[illegible]2.3 [illegible]

[illegible]25kHz[illegible]20[illegible]25kHz×2×10^{10}[illegible]5×10^{5}GHz[illegible]

[illegible]“[illegible]”[illegible]200[illegible]100[illegible]5000[illegible]20[illegible]1[illegible]100[illegible]2000[illegible]20[illegible]

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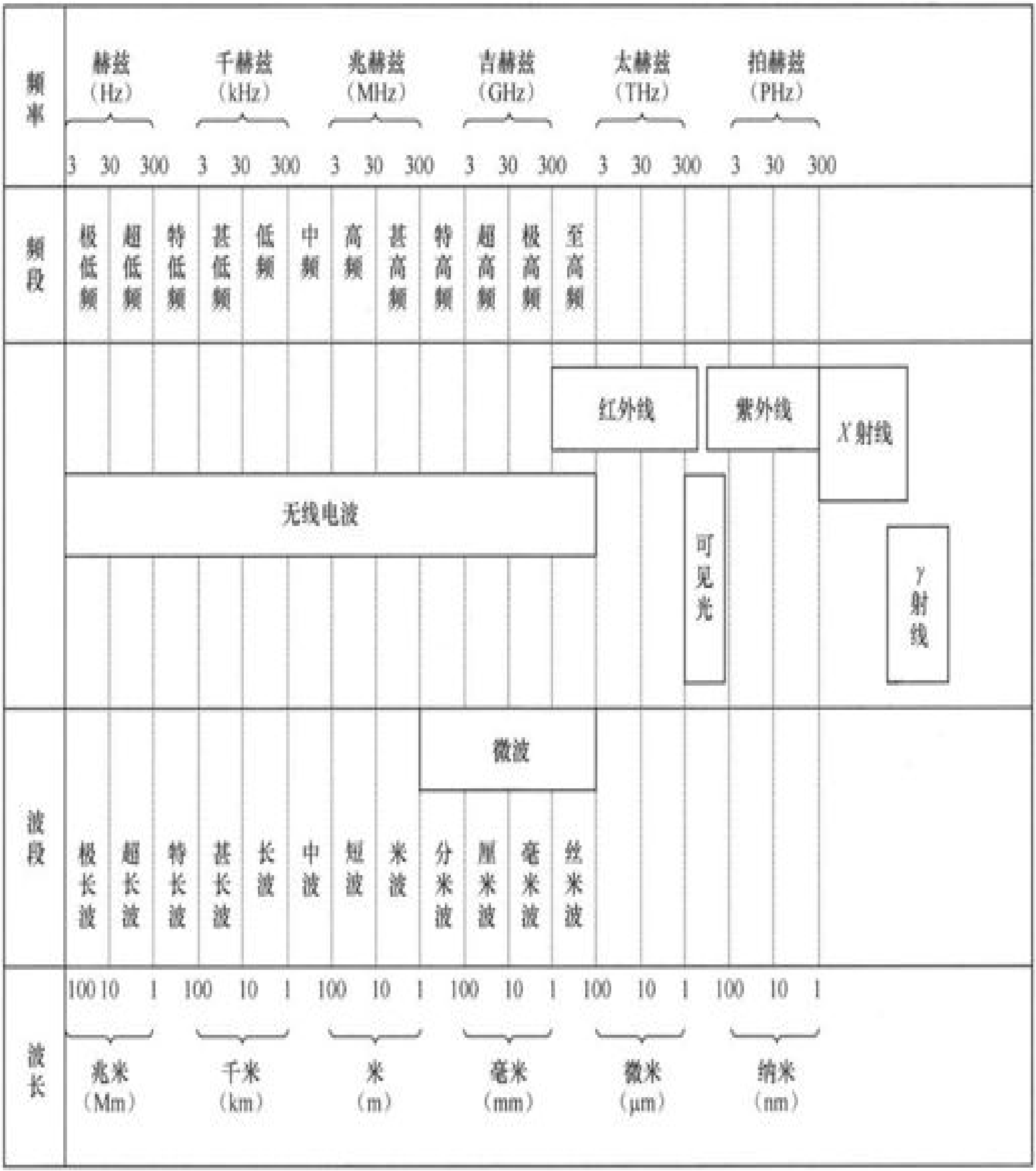
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[illegible]GSM[illegible]WCDMA[illegible]TD-SCDMA[illegible]LTE[illegible]——[illegible]

2.1.2 [illegible]——[illegible]

[illegible]ITU[illegible]2.4[illegible]

[illegible]ITU[illegible]30kHz[illegible]300GHz[illegible]2.1.1[illegible]500000GHz[illegible]MHz[illegible]500000GHz[illegible]



[illegible]2.4 [illegible]

[illegible]GSM[illegible]CDMA[illegible]WCDMA[illegible]TD-SCDMA[illegible]cdma2000[illegible]

[illegible]

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□□300MHz□3GHz□□□□□□□□□□□□□□□□□□

□□□GSM□□□□□□□□

PGSM 900M□□□□□890□915MHz□□□935□960MHz□□□□25MHz□□□□□□□□45MHz□□

EGSM 900M□□□□□880□890MHz□□□925□935MHz□□□□10MHz□□□□□□□□45MHz□□

GSM1800□□□□□□□1710□1785MHz□□□□□1805□1880MHz□□□□75MHz□□□□□□□□95MHz□□

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900M□□——□□885□909MHz□5MHz EGSM□□19MHz PGSM□□□

1800M□□——□□1710□1725MHz□□1805□1820MHz□

□□□□

900M□□——□□909□915MHz□6MHz PGSM□□□

1800M□□——□□1740□1755MHz□□1835□1850MHz□

□CDMA□IS-95□□□□□□□□□□□□□□□□CDMA□□□10MHz□□□□□□□825□835MHz□□870□880MHz□□GSM900M□□□□□□□□□45MHz□

2009□1□7□□□□□□□□□□□□□□□□□□□□□3□□□□□□3G□□□□□□□□□□□TD-SCDMA□□□□□□□□□□□□□□□WCDMA□cdma2000□□3□□□□□□□□□

□□□□□□TD-SCDMA□□1880□1920MHz□2010□2025MHz□□□□□□1880□1920MHz□□□□□□□□□□2011□□□□□□□□□□□

TD□□□□□□□□TD-SCDMA□TDD□□□□□□□□□□□□GSM□CDMA□□□□□
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□□□□□WCDMA□□□□□1940□1955MHz□□□□□2130□2145MHz□□□
□□15MHz□□□□□□□□□□90MHz□□□

□□□□□cdma2000□□□□□1920□1935MHz□□□2110□2125MHz□
□□□□15MHz□□□□□□□□□□90MHz□□□

2.1.3 □□□□□□——□□□□□□□□

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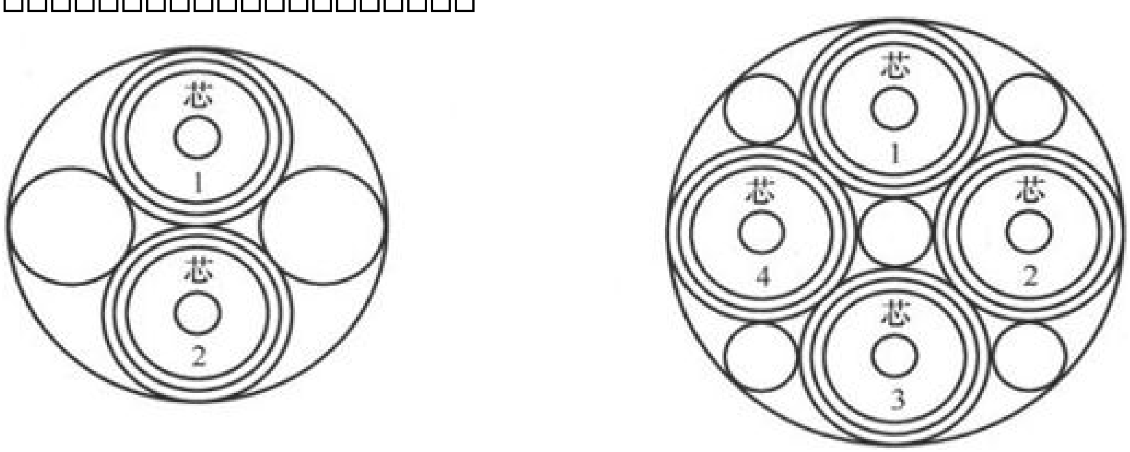
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□□□□□□□□□□□□3G□10MHz□□□□□□77□□□□□1MHz□□□□7.7□□
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1MHz□□□□□16□□□□□□□□□□□□□□□□

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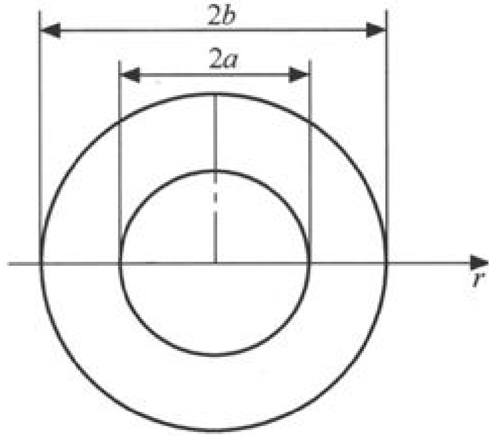
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□2.5 □□□□

[illegible]2.6[illegible]2a[illegible]2b[illegible]n_1[illegible]n_2[illegible]



[illegible]2.6 [illegible]

[illegible]

[illegible]“[illegible]”[illegible]CDMA[illegible]800MHz[illegible]GSM[illegible]900MHz[illegible]1800MHz[illegible]“[illegible]”[illegible]

[illegible]1920[illegible]1935MHz[illegible]cdma2000[illegible]800MHz[illegible]3G[illegible]900MHz[illegible]885[illegible]909MHz[illegible]24MHz[illegible]909[illegible]915MHz[illegible]6MHz[illegible]18MHz[illegible]

2.1.4 [illegible]

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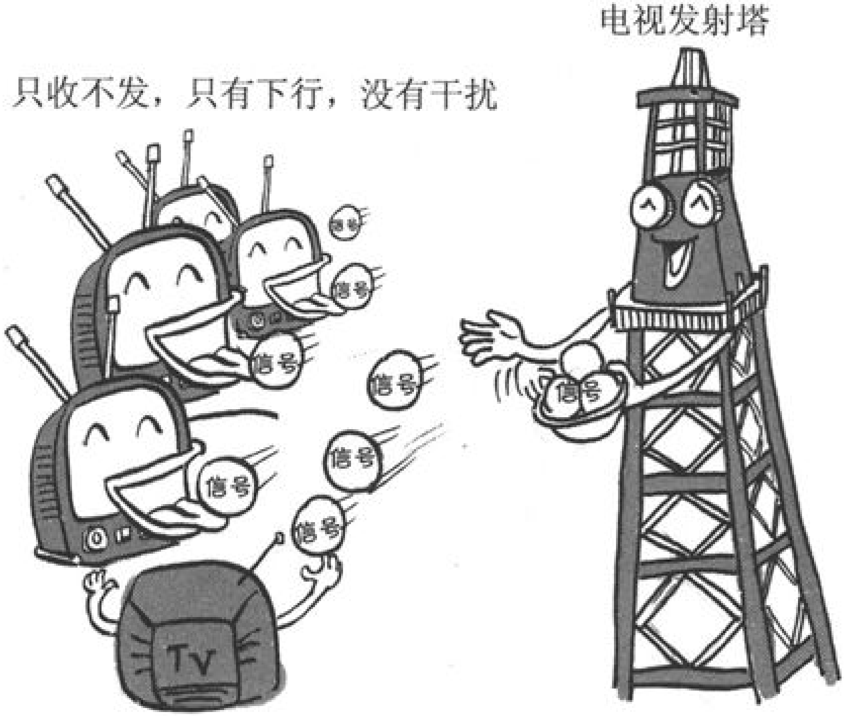
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[illegible]“Broadcast”[illegible]100MHz[illegible]25kHz[illegible]100.000MHz[illegible]100.025MHz[illegible]25kHz[illegible]2.7[illegible]

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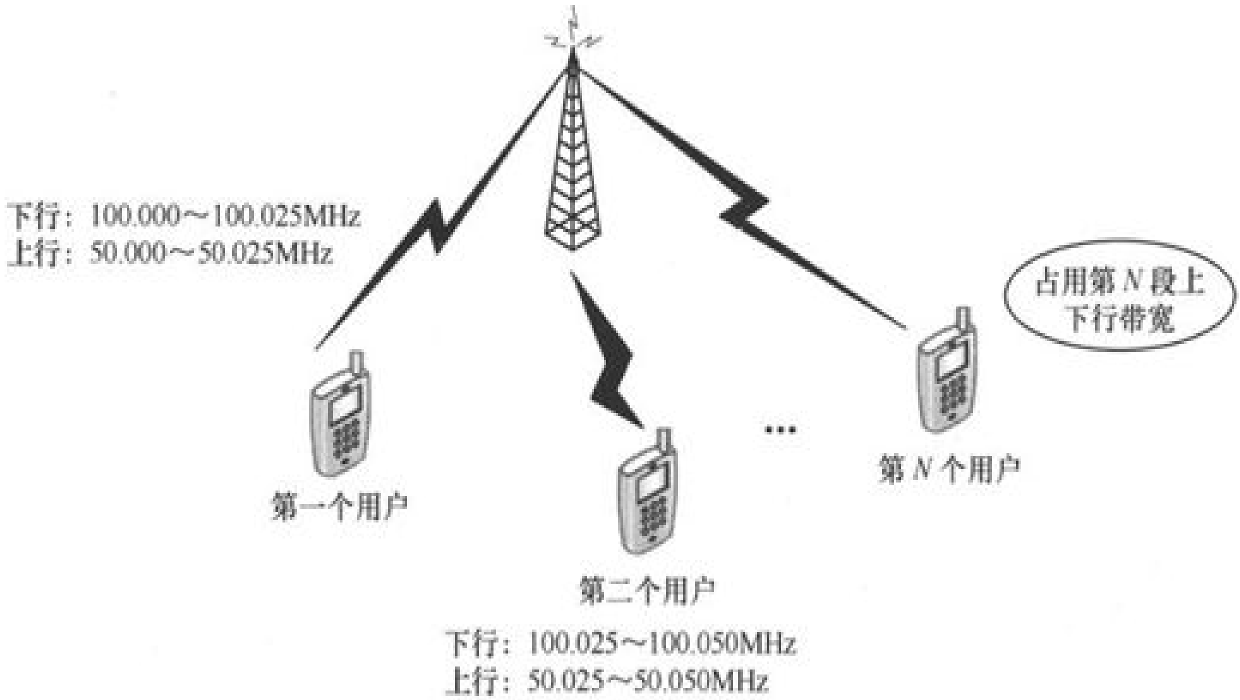


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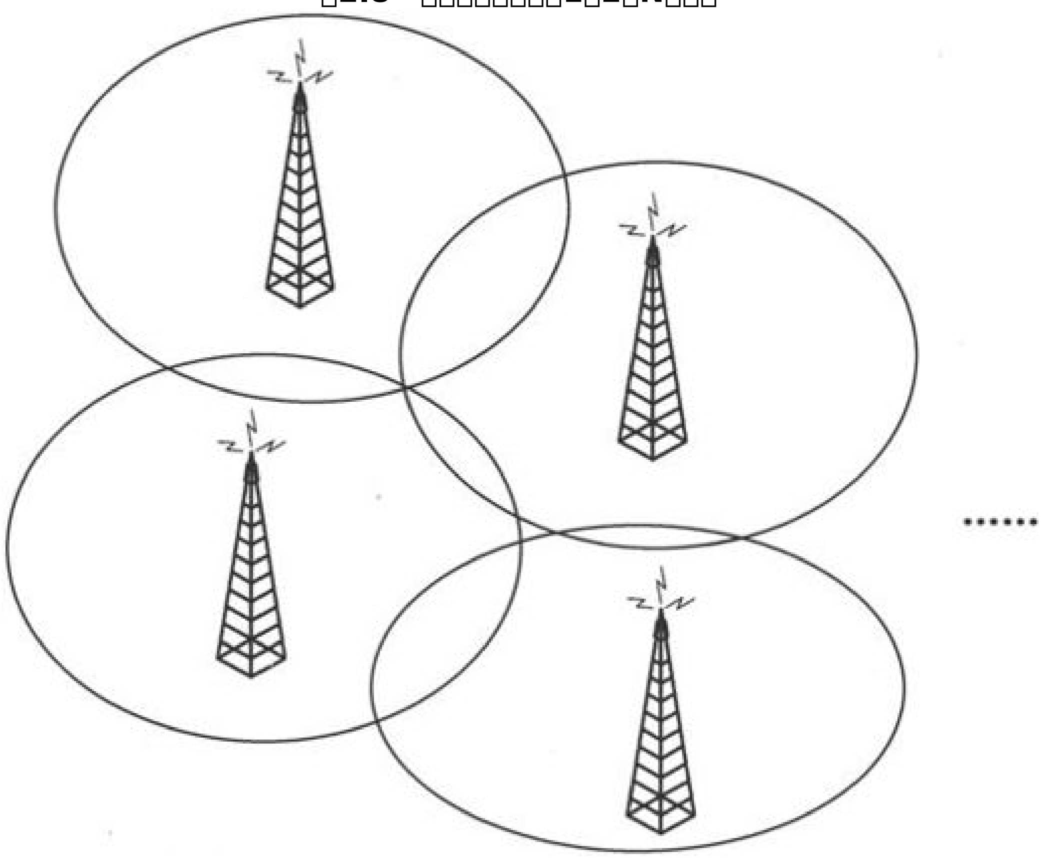
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300kHz[illegible]3000[illegible]30000[illegible]——[illegible]2800km^2[illegible]2.8km^2[illegible]2.8km^2[illegible]30[illegible]30×25kHz[illegible]750kHz[illegible]2.9[illegible]2.9[illegible]100[illegible]100[illegible]BSC[illegible]Base Station Controller[illegible]MSC[illegible]Mobile Switching Center[illegible]



下行：100.000～100.025MHz
上行：50.000～50.025MHz
占用第 N 段上下行带宽
第一个用户
第二个用户
第 N 个用户
下行：100.025～100.050MHz
上行：50.025～50.050MHz

[illegible]2.8 [illegible]1[illegible]2[illegible]N[illegible]



[illegible]2.9 [illegible]

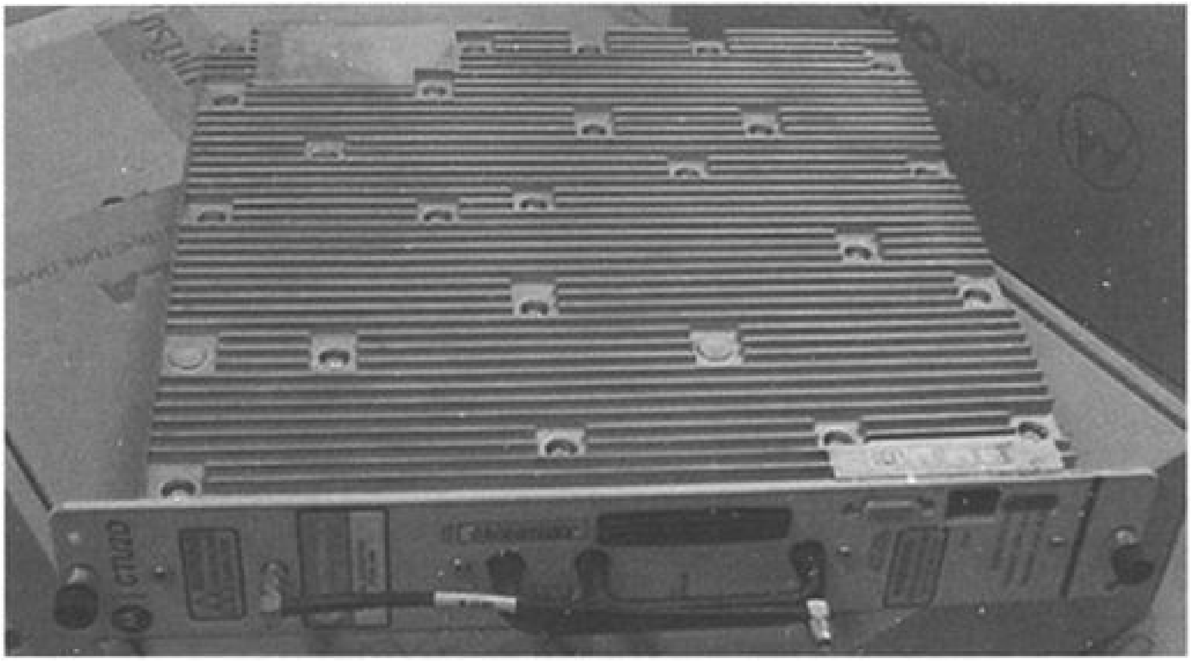
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2.2.1 [illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]2.1[illegible]“[illegible]”[illegible]

[illegible]GSM[illegible]GSM[illegible]200kHz[illegible]GSM[illegible]200kHz[illegible]FDM[illegible]Frequency Division Multiplexing[illegible]N[illegible]2.10[illegible]N[illegible]“Communicaiton”[illegible]“Broadcast”[illegible]



[illegible]2.10 [illegible]

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[illegible]3[illegible]SDM[illegible]FDM[illegible]TDM[illegible]GSM[illegible]3[illegible]GSM[illegible]“[illegible]”[illegible]CDMA[illegible]Code Division Multiple Access[illegible]

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2.2.2 [illegible]·[illegible]

CDMA[illegible]——[illegible]·[illegible]2.11[illegible]1913[illegible]



[illegible]2.11 [illegible]·[illegible]

[illegible]——[illegible]

[illegible]

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[illegible]“[illegible]”[illegible]·[illegible]“[illegible]”[illegible]“1234567”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

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		时分							
		时隙 1	时隙 2	时隙 3	时隙 4	时隙 5	时隙 6	时隙 7	时隙 8
频分	频点 1	用户 1	用户 2	用户 3	用户 4	用户 5	用户 6	用户 7	用户 8
	频点 2	用户 9	用户 10	用户 11	用户 12	用户 13	用户 14	用户 15	用户 16
	频点 3								
	频点 4								
	频点 5								
	频点 6								
	频点 7								
	频点 8								
	⋮								
	频点 25								用户 *N*

[illegible]2.12 GSM[illegible]

GSM[illegible]WCDMA[illegible]2.13[illegible]

		5MHz 频宽
码分	扩频码 1	用户 1
	扩频码 2	用户 2
	扩频码 3	用户 3
	扩频码 4	用户 4
	扩频码 5	用户 5
	扩频码 6	用户 6
	扩频码 7	用户 7
	扩频码 8	用户 8
	⋮	……
	扩频码 N	用户 N

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[illegible]5MHz[illegible]5MHz[illegible]20[illegible]3400Hz[illegible]2.13[illegible]5MHz[illegible]

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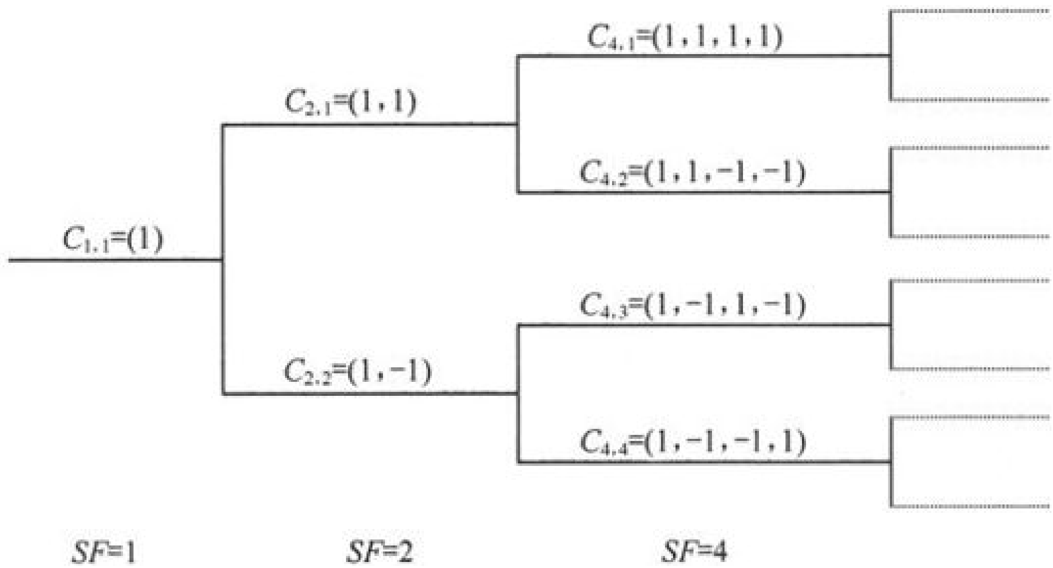
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[illegible]+1[illegible]+1[illegible]+1[illegible]+1[illegible]+1[illegible]+1[illegible]-1[illegible]-1[illegible]2.14[illegible]0[illegible]

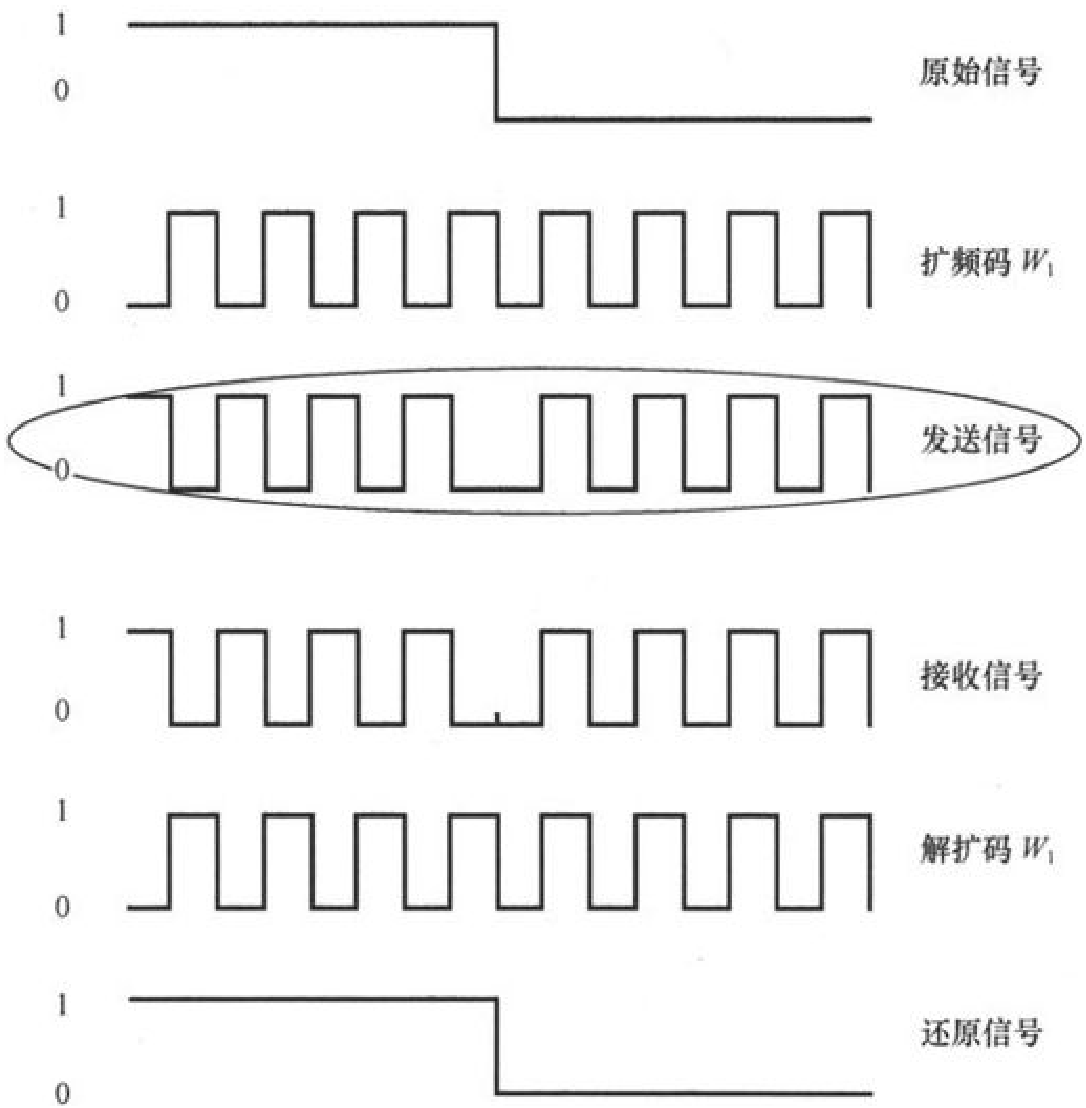
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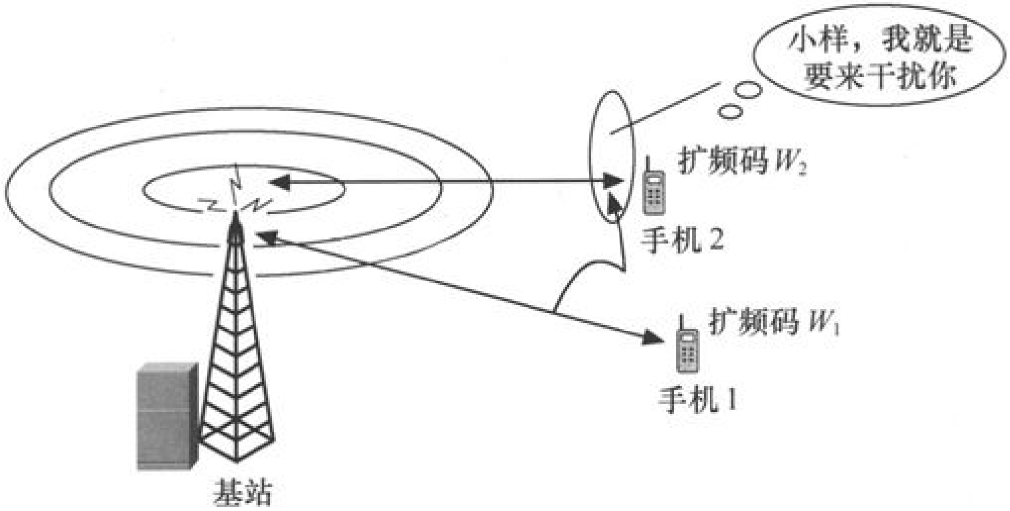
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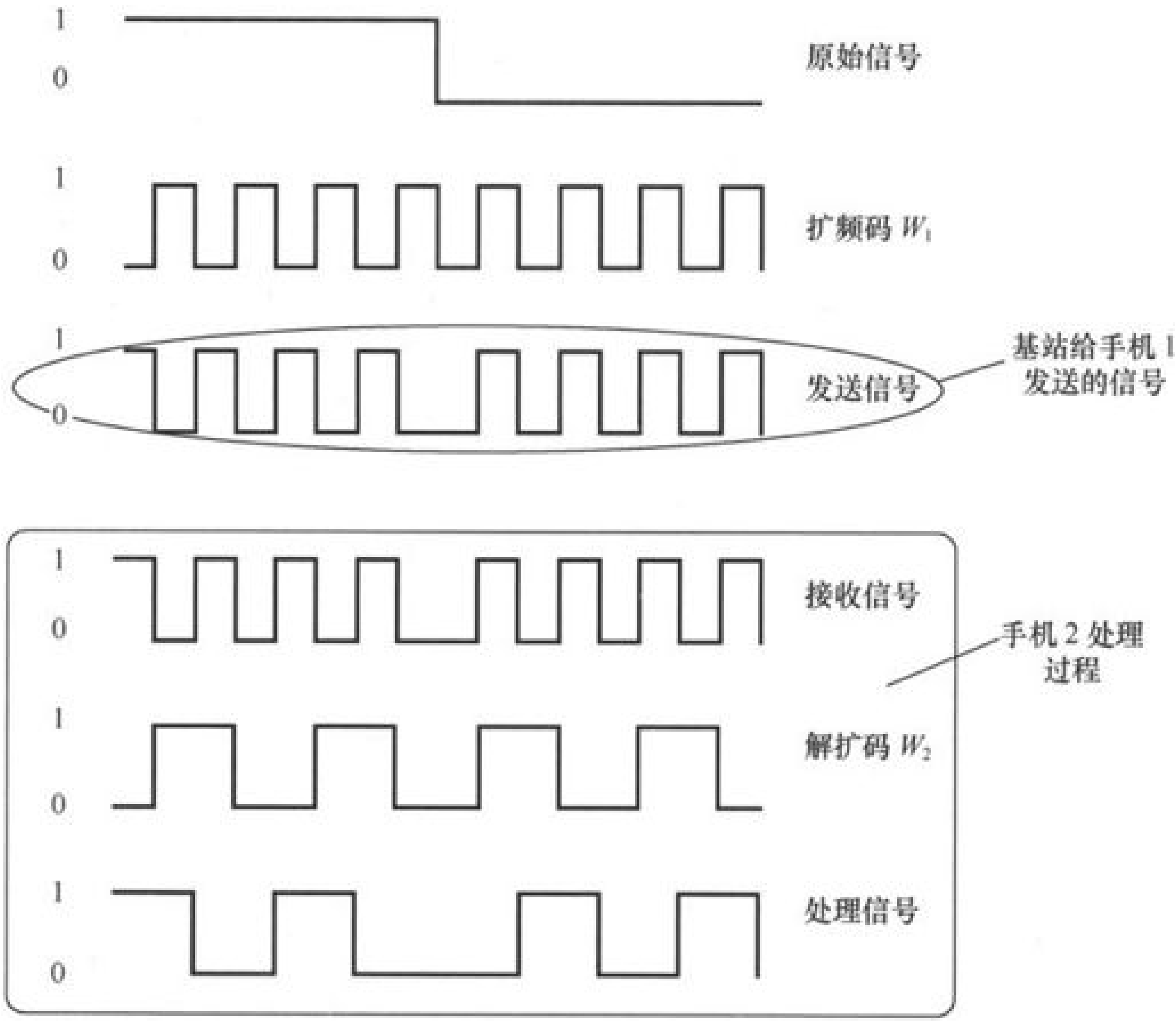
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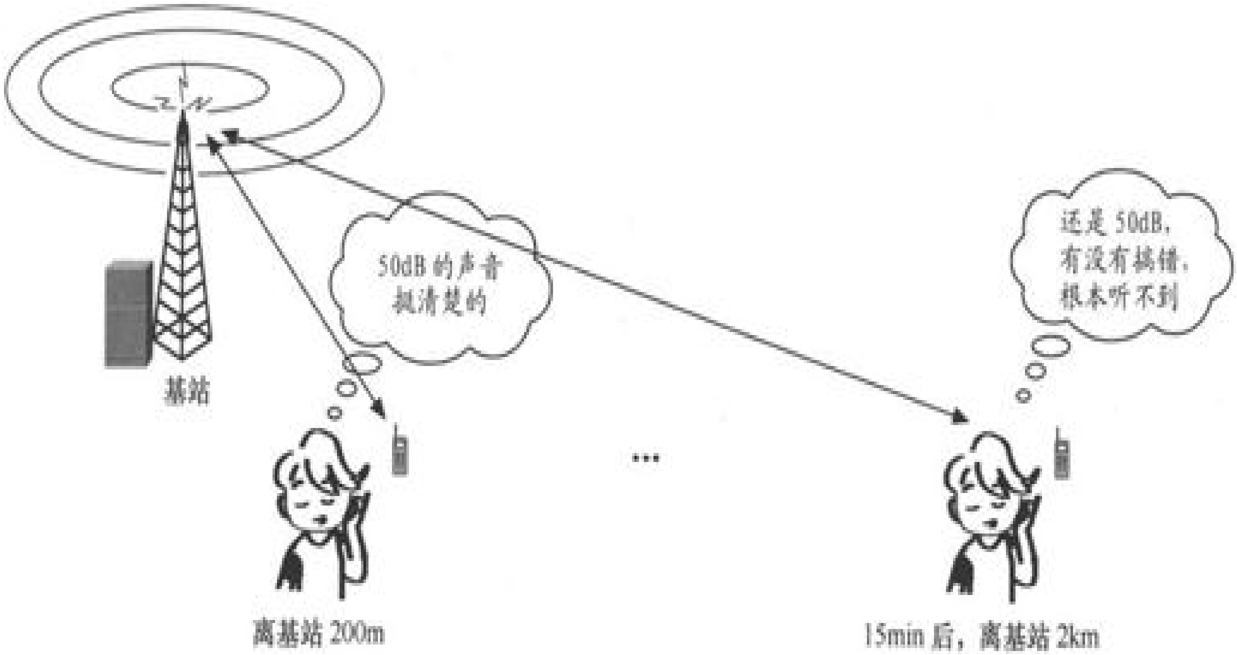
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2.2.3 □□□□□□□□□□□□□□□□□□□□

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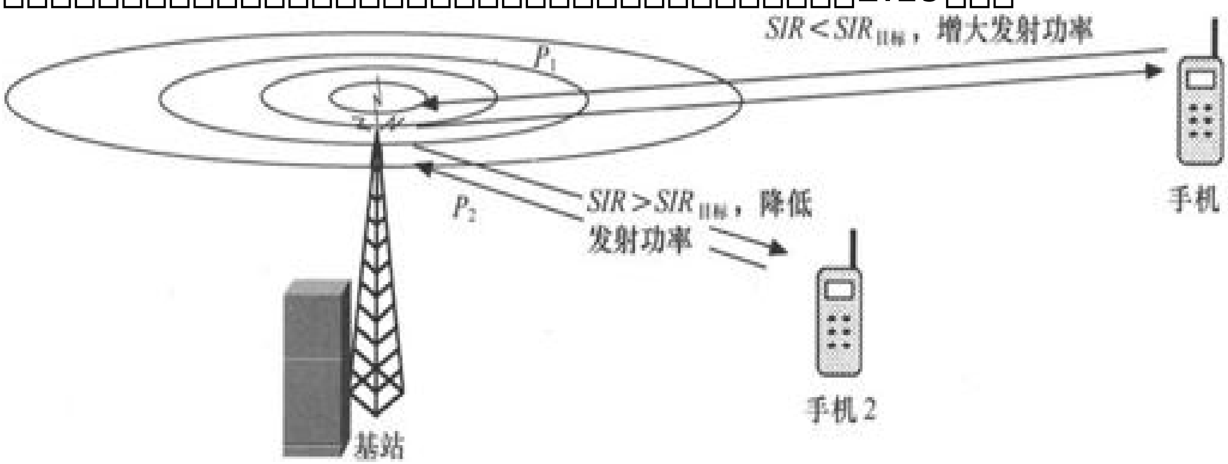
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□2.19 □□□□□□□SIR□□

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1500[illegible]/s[illegible]TD-SCDMA[illegible]200[illegible]/s[illegible]cdma2000[illegible]800[illegible]/s[illegible]

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[illegible]60[illegible]VAD[illegible]Voice Activity Detection[illegible]500bit/s[illegible]“[illegible]”[illegible]

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2.2.5 [illegible]

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[illegible]2050[illegible]2050[illegible]GSM[illegible]4.615ms[illegible]WCDMA[illegible]TD-SCDMA[illegible]10ms[illegible]GSM[illegible]2050[illegible]2050×4.615ms[illegible]9460.75ms[illegible]9.46s[illegible]WCDMA[illegible]TD-SCDMA[illegible]2050[illegible]2050×10ms[illegible]20500ms[illegible]20.5s[illegible]

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[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]

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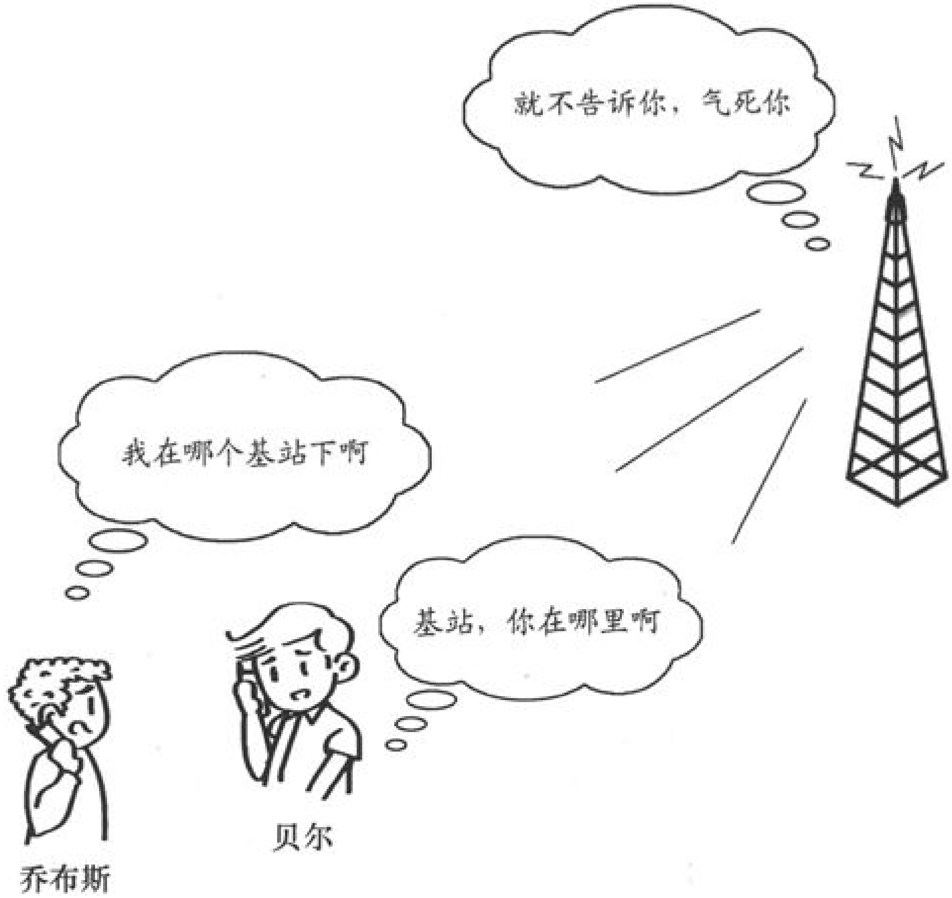
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[illegible]

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CDMA[illegible]CDMA[illegible]CDMA[illegible]110[illegible]

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3[illegible]

[illegible]

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CDMA[illegible]

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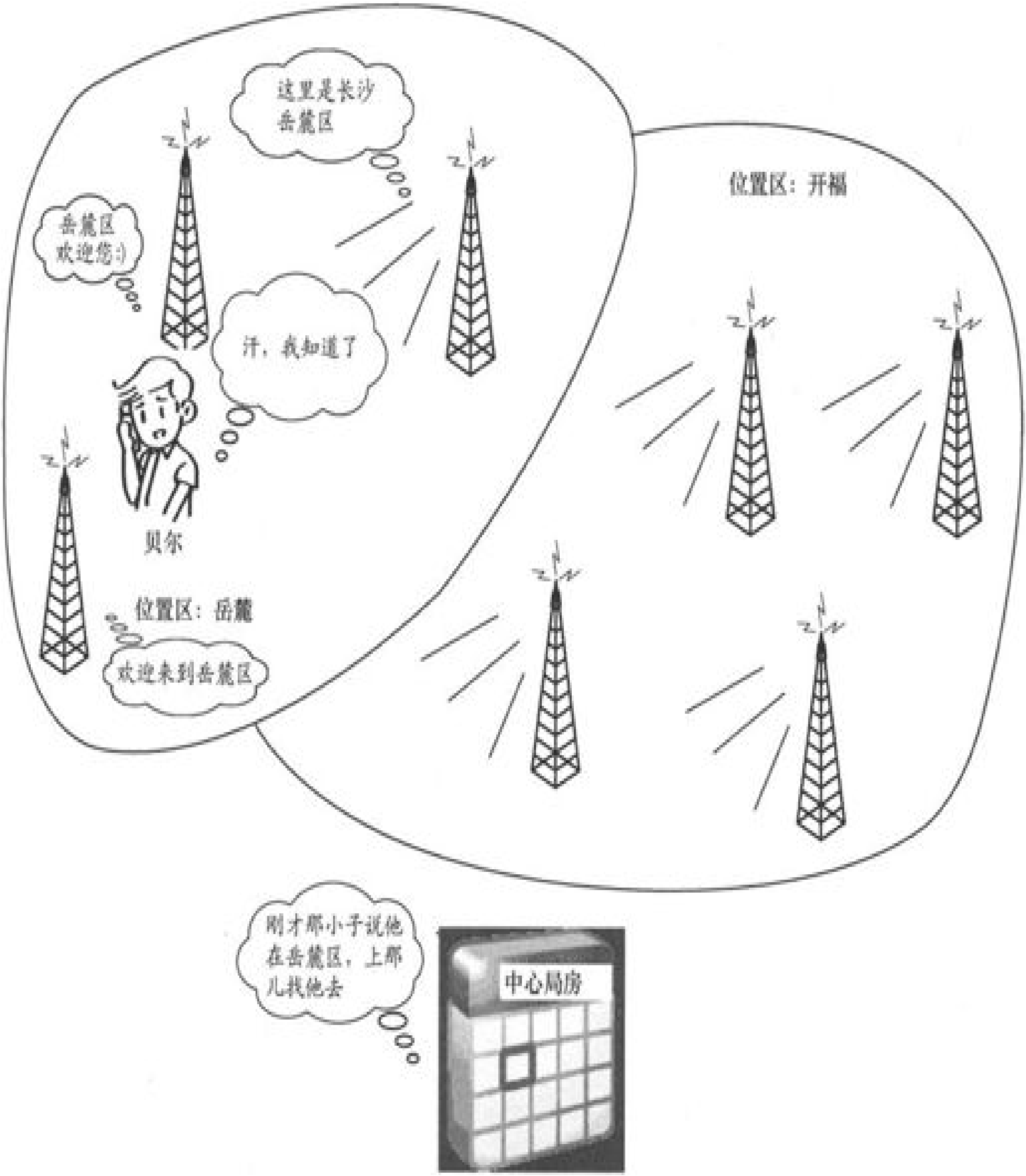
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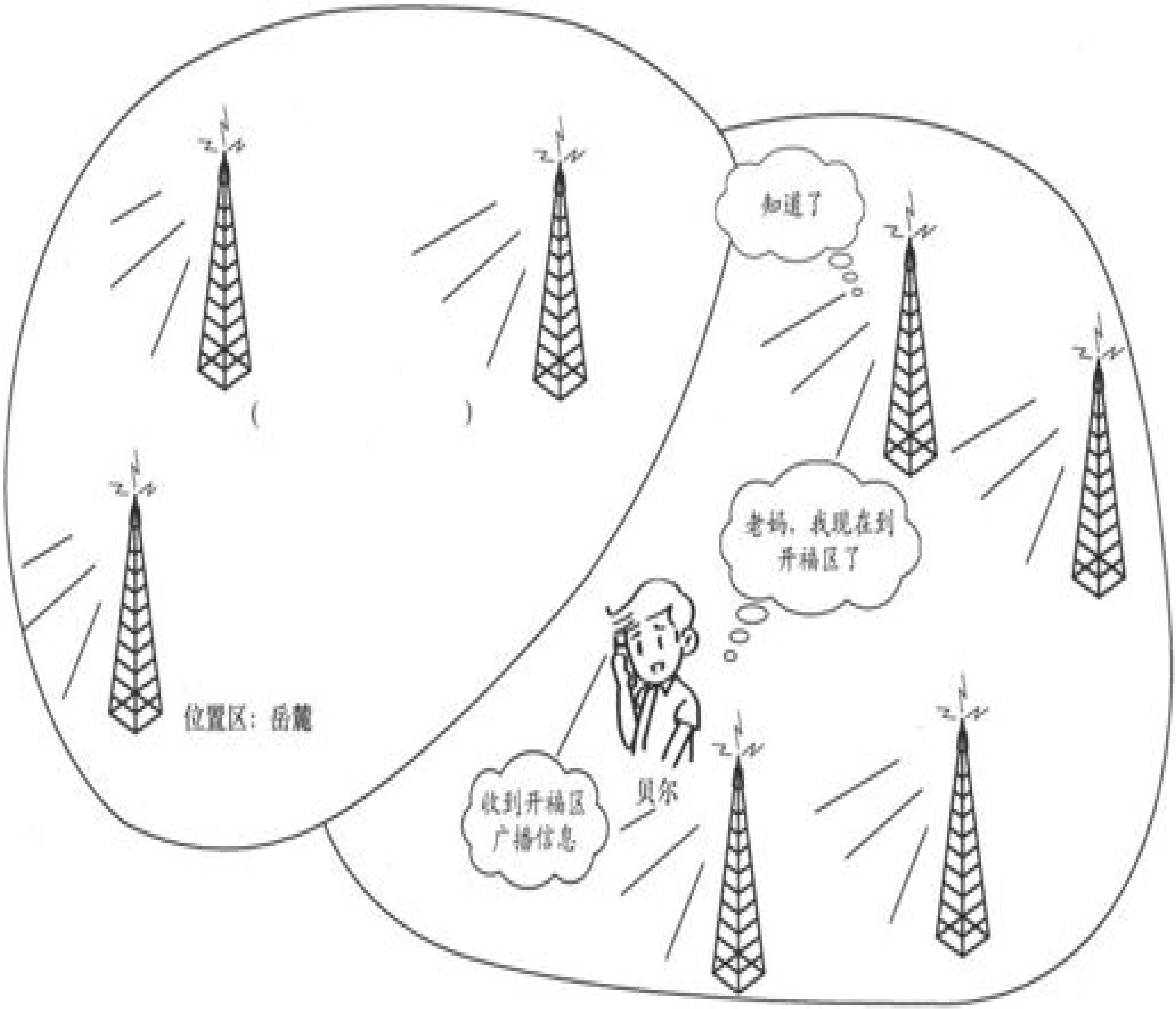
××，你在哪里
××，你在哪里
××，你在哪里
真烦啊，到处都在喊，
哥们我真是无处可藏啊
××，你在哪里
××，你在哪里


这里是长沙
岳麓区
岳麓区
欢迎您:)
汗，我知道了
贝尔
位置区：岳麓
欢迎来到岳麓区
位置区：开福
刚才那小子说他
在岳麓区，上那
儿找他去
中心局房

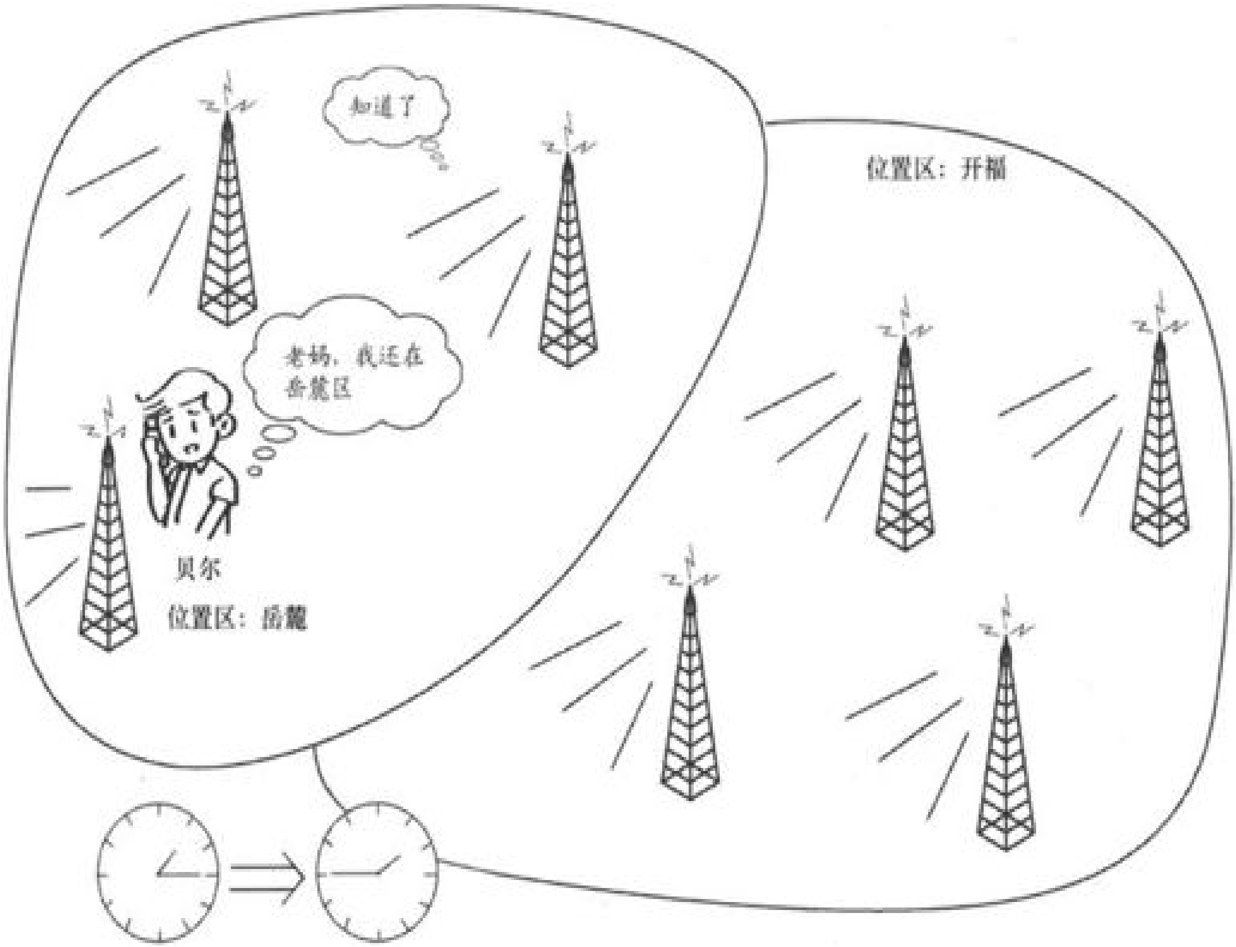
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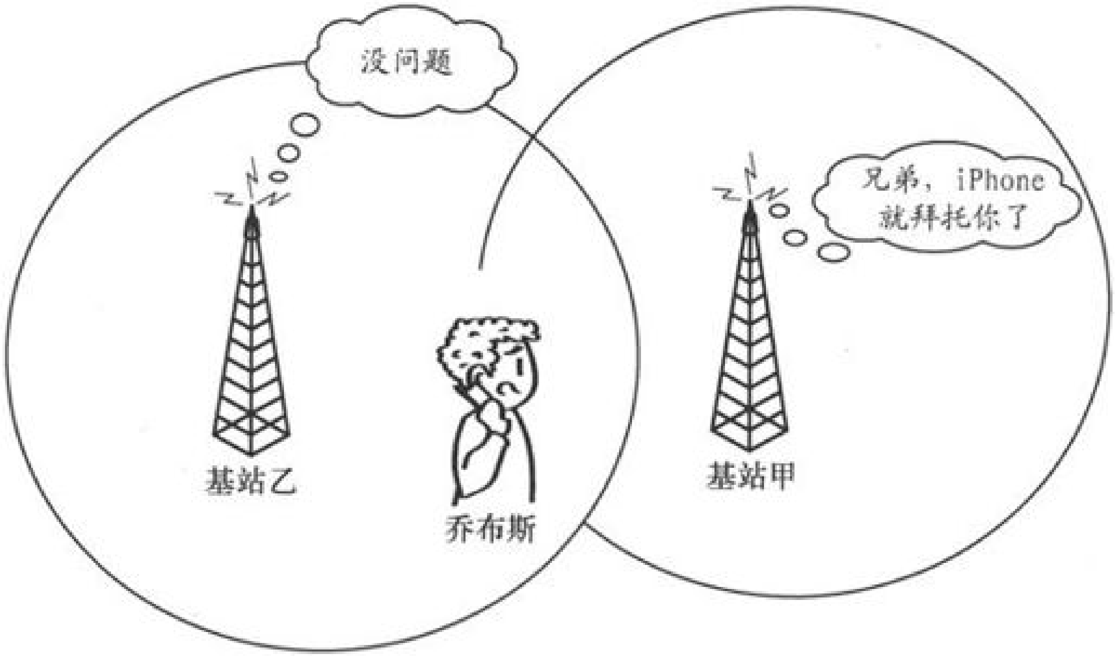
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Handover[illegible]“[illegible]”[illegible]“iPhone[illegible]”[illegible]2.25[illegible]



[illegible]2.25 [illegible]

[illegible]

[illegible]

[illegible]

[illegible]GSM[illegible]GSM[illegible]GSM[illegible]CDMA[illegible]

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[illegible]

[illegible]

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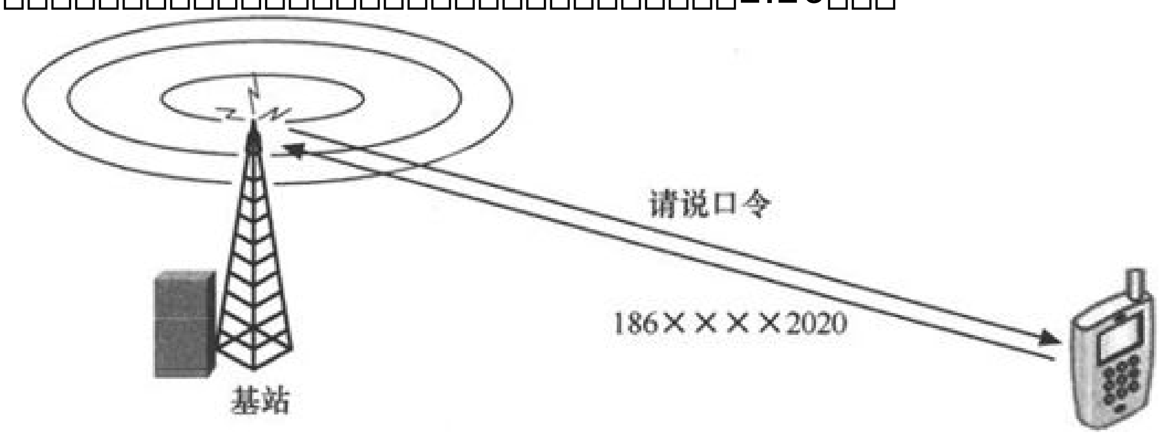
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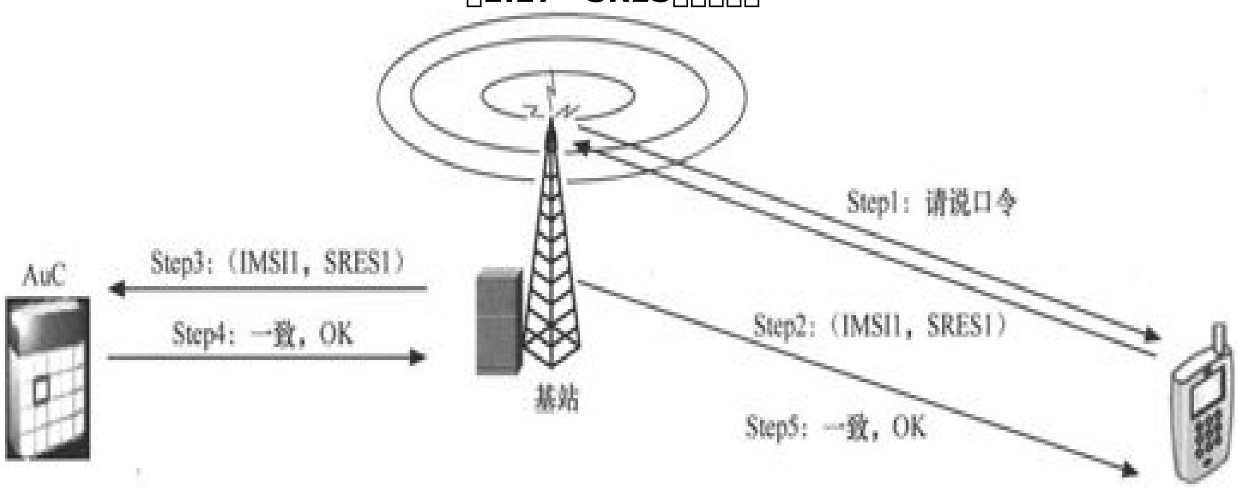
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[illegible]GSM[illegible]SIM[illegible]Ki[illegible]Ki[illegible]IMSI[illegible]IMSI[illegible]Ki[illegible]IMSI[illegible]Ki[illegible]AuC[illegible]IMSI[illegible]Ki[illegible]

[illegible]Ki[illegible]A3[illegible]SRES[illegible]IMSI[illegible]SRES[illegible]ACU[illegible]2.27[illegible]2.28[illegible]



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[illegible]2.28 [illegible]

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[illegible]IMSI[illegible]SRES[illegible]

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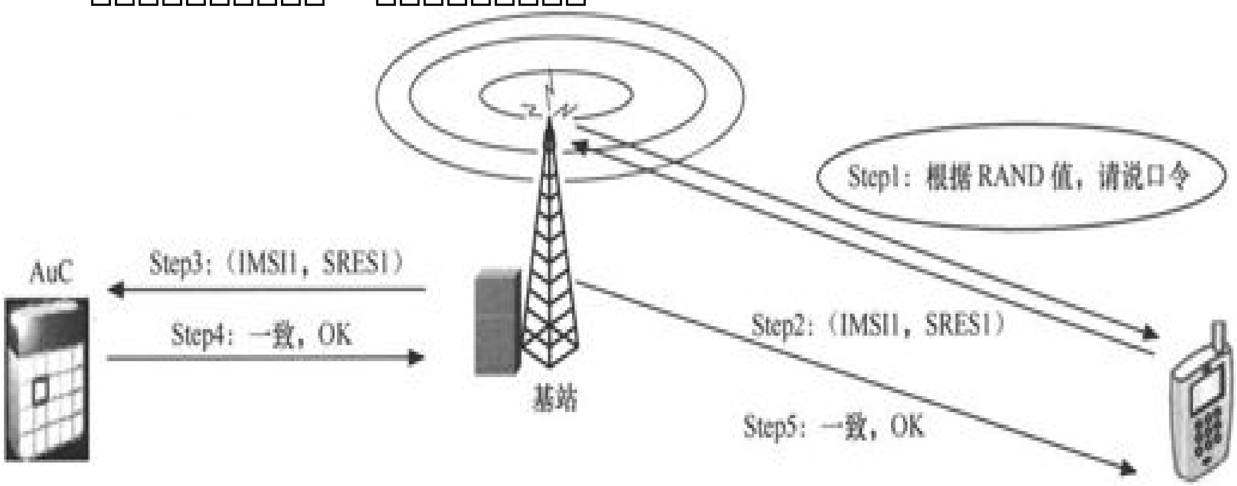
□2.29 SRES□□□□□

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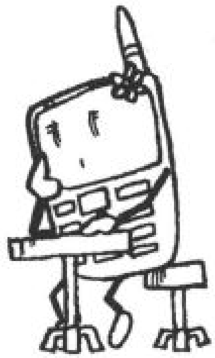
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Chapter 3
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3.1 □□□□□□——□□□GSM□□□□

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3.1.1 [illegible]

[illegible]“communication”[illegible]

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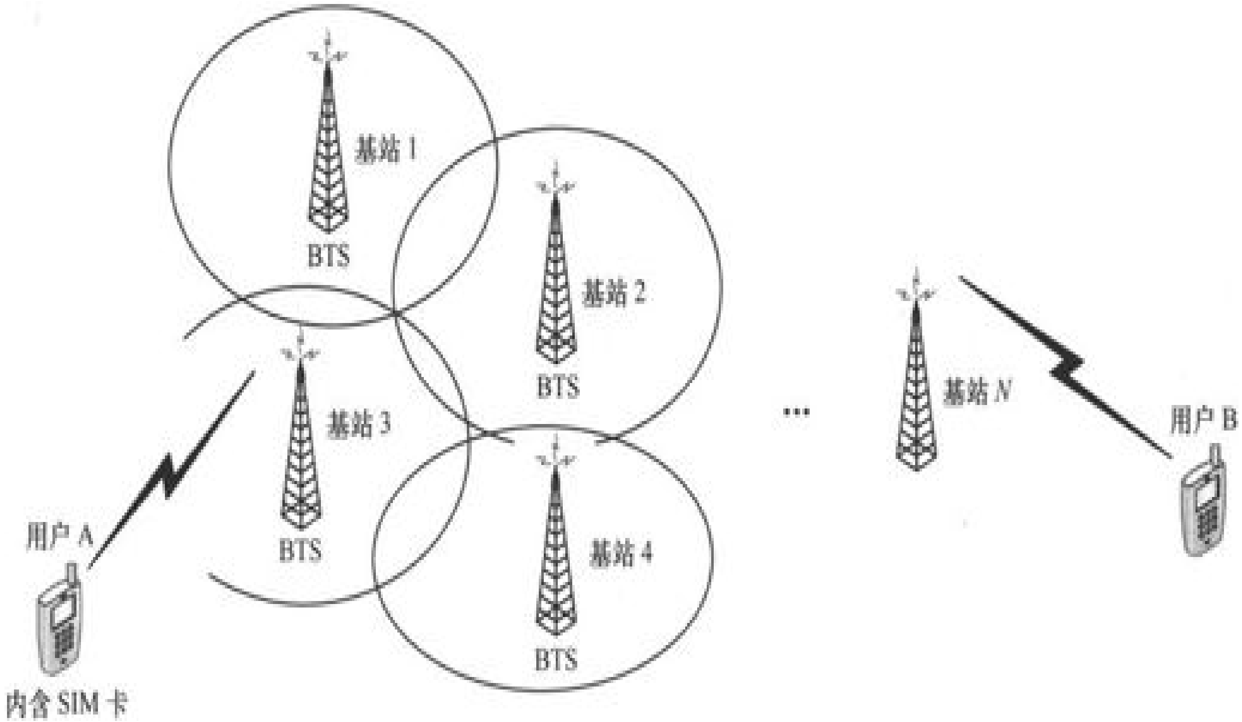
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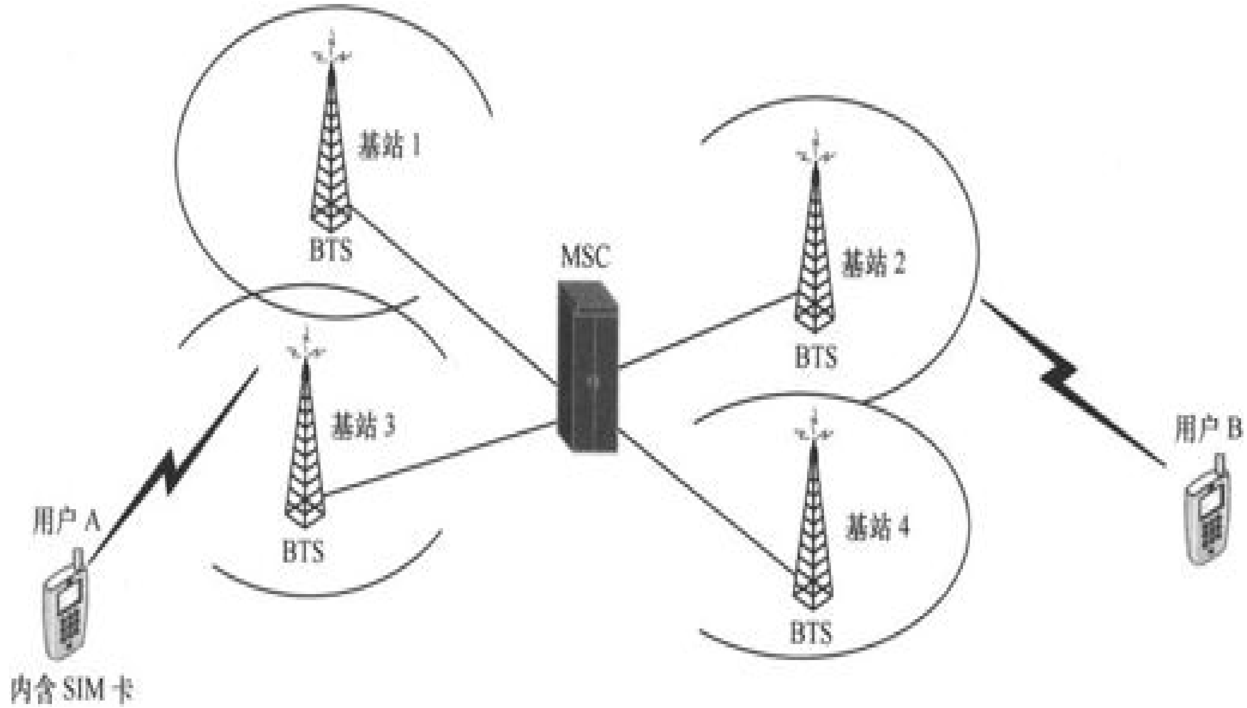
□3.1 □□□□“GSM□□”□1

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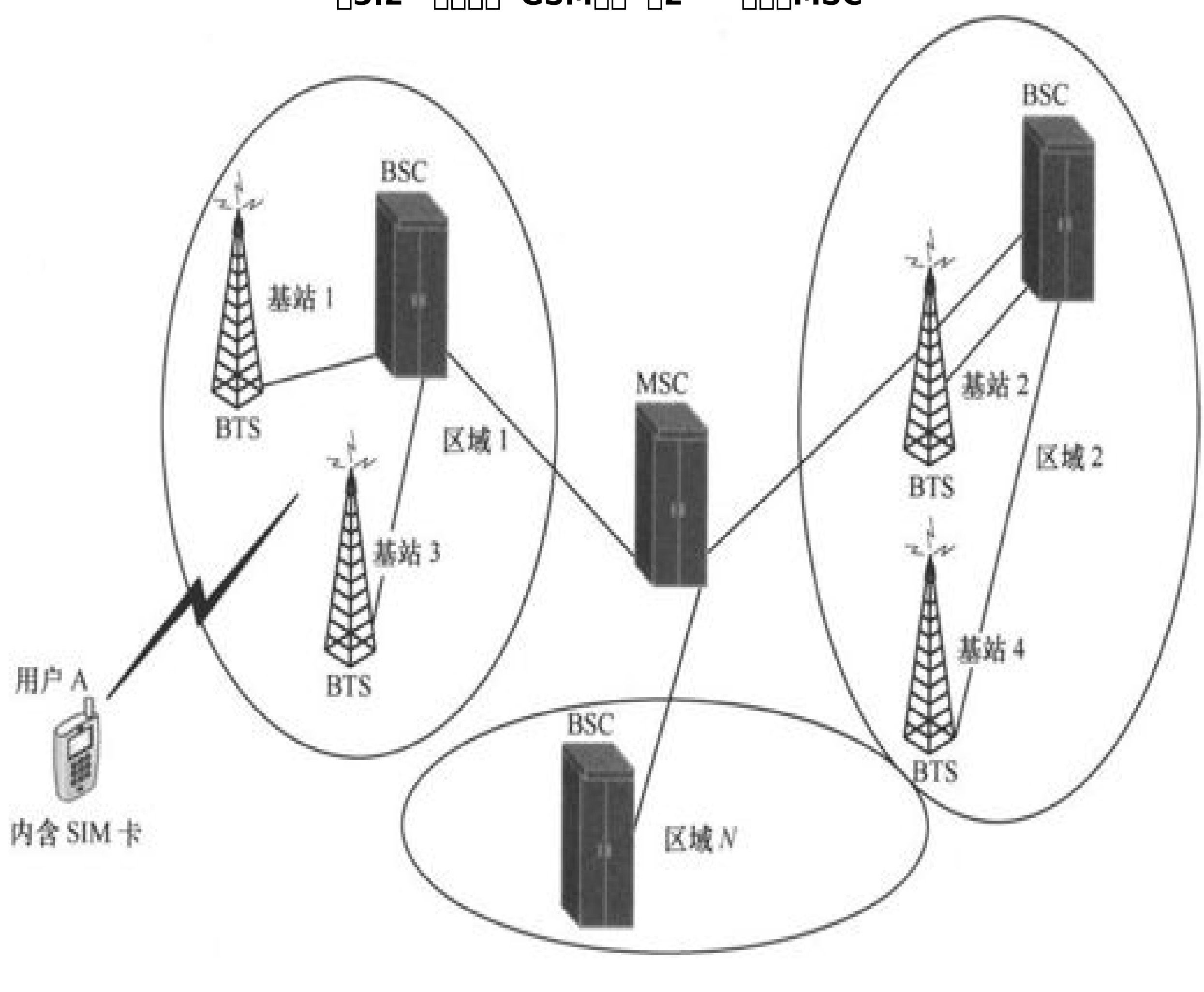
2□□□□□□——BSC

□2□□□1□□□□MSC□□□□MSC□□□□□□□□□□□□□□□1□□“□□”□□□□□□□□□□“□□□□”□□□□□□

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基站 1
BTS
MSC
基站 2
BTS
基站 3
BTS
基站 4
BTS
用户 A
内含 SIM 卡
用户 B

□3.2 □□□□“GSM□□”□2——□□□MSC


BSC
基站 1
BTS
区域 1
基站 3
BTS
MSC
BSC
基站 2
BTS
区域 2
基站 4
BTS
BSC
区域 N
用户 A
内含 SIM 卡

[illegible]3.3 [illegible]“GSM[illegible]”[illegible]3——[illegible]BSC

[illegible]3[illegible]“[illegible]”[illegible]

3.1.2 [illegible]

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1[illegible]——HLR

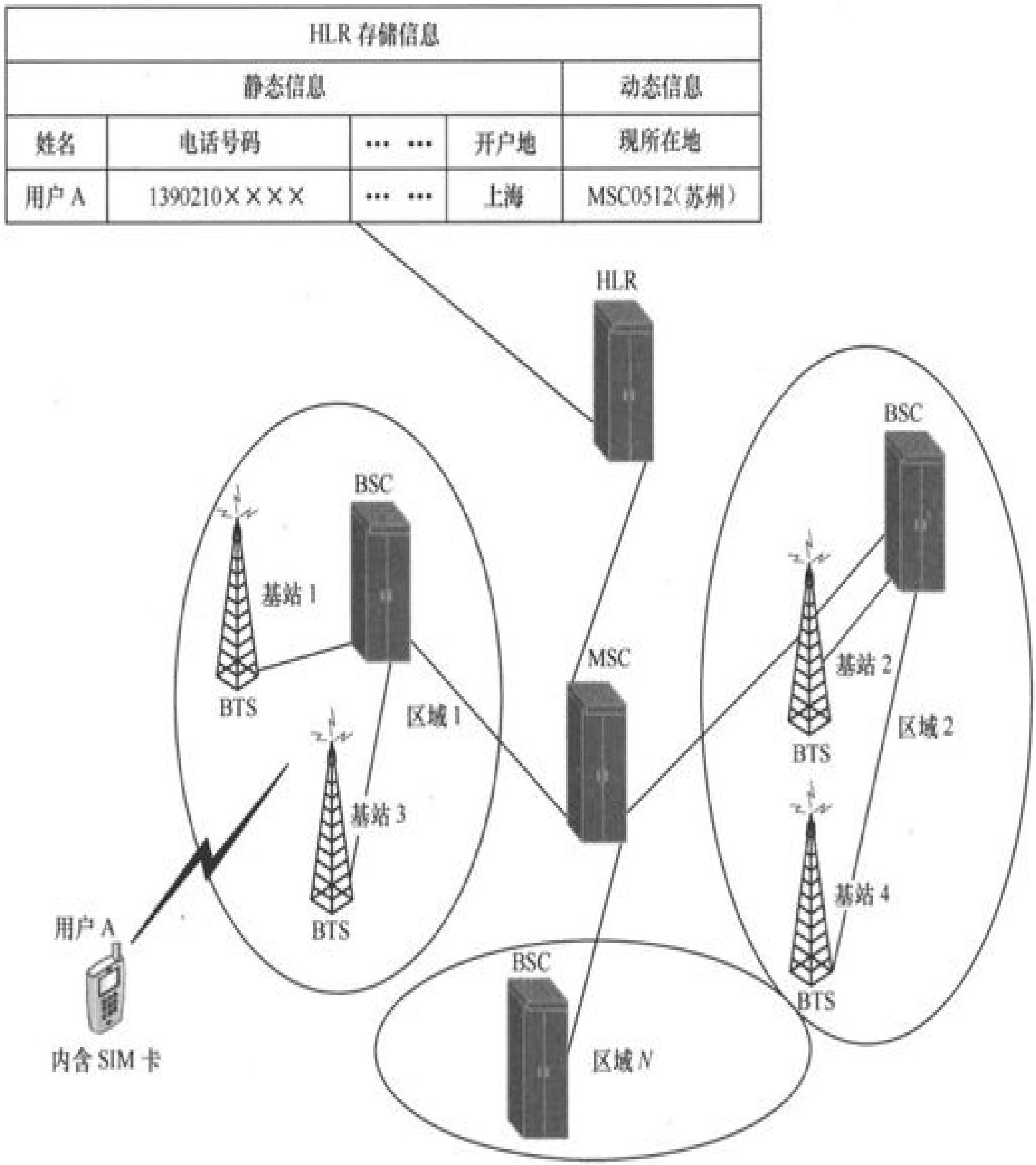
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HLR 存储信息				
静态信息				动态信息
姓名	电话号码	··· ···	开户地	现所在地
用户 A	1390210××××	··· ···	上海	MSC0512（苏州）

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[illegible]3.5[illegible]

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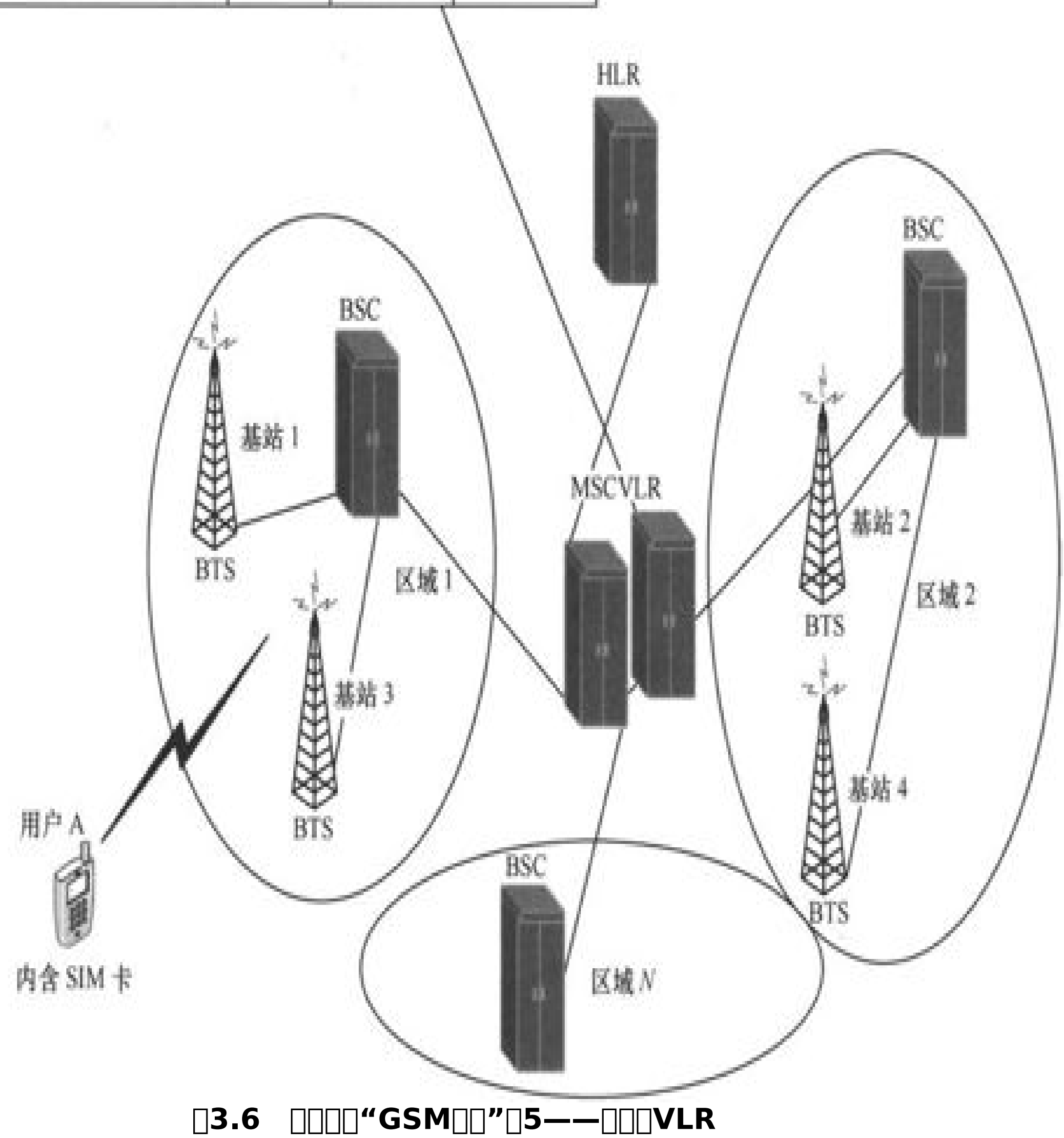
□3.5 □□□□“GSM□□”□4——□□□HLR

2□□□□□□□——VLR

□□□3.5□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□MSC□□□□□□□□□□□□□□□□□□□□□□□□□□□□□BSC□□□□□□HLR□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□VLR□Visitor Location Register□□□□□□□□□□□□□□□□□□□□BSC□□□□□□□□□□□3.5□□□□□□□□□□□3.6□

□□□□□□□□□□□□VLR□□□□□□□□□□□□□□□□□“VLR□□□□□□A□BSC1□”□□□□□□□□2.3.2□□□□□□□□□□□□□□□□□□□□□□A□□□BSC□□□□□□□□□□A□□□□□□□□□□□□□2.3.2□□□□□□□□□□

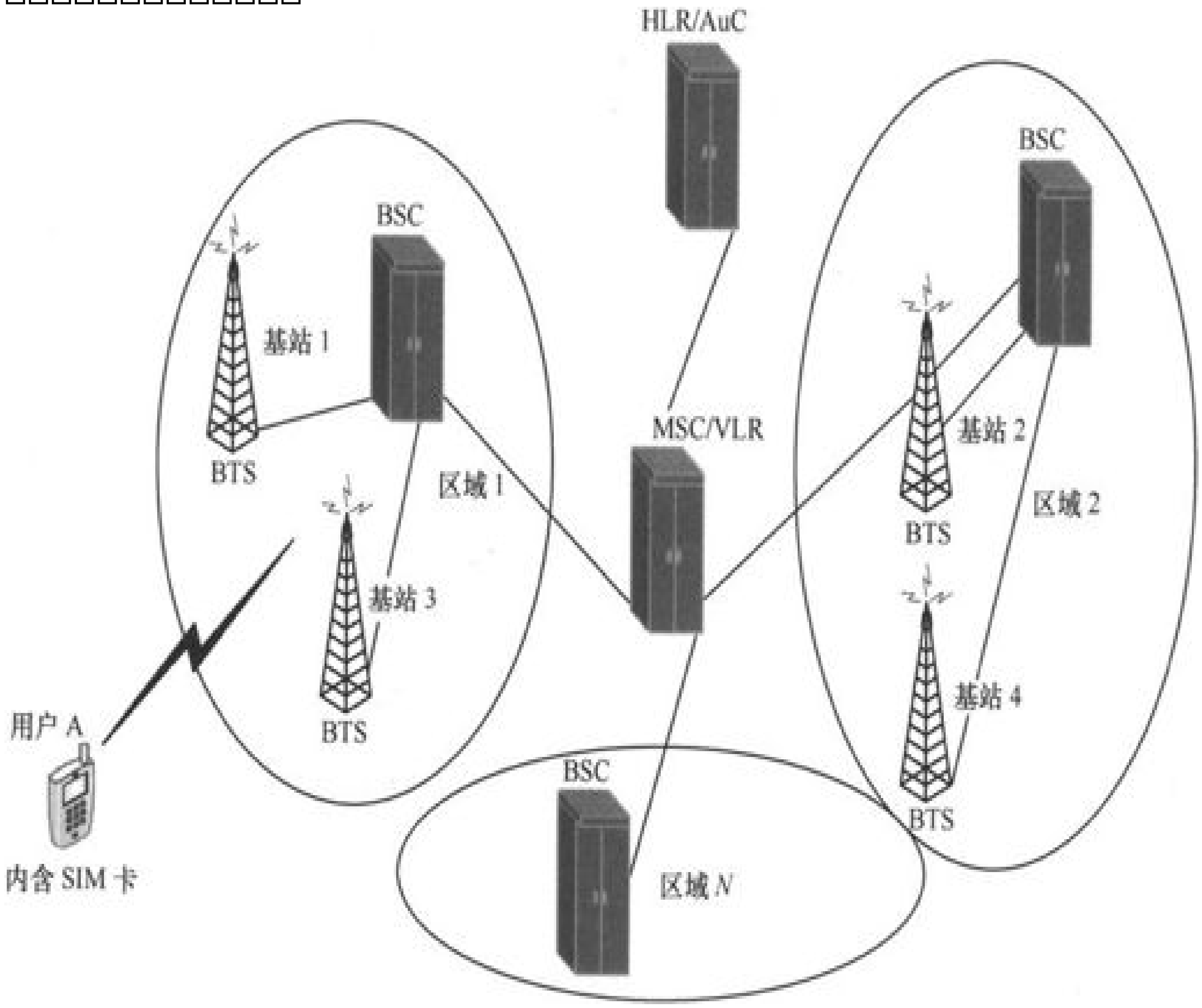
VLR 存储信息				
姓名	电话号码	··· ···	开户地	现所在 BSC
用户 A	1390210××××	··· ···	上海	BSC1



□3.6　□□□□“GSM□□”□5——□□□VLR

□□□3.6□□□□□□□□□□□“GSM□□”□□□□□□□□GSM□□□□□□□□□□□□□□□□□□□□□□□□□□2.3.4□□□□□□□□□□□□□□“□□”□□□3.6□□□□□□□□□□□□□□□□“□□□□”□AuC□Authentication Center□□□□□□□MSC□VLR□□□□□□□□□□HLR□AuC□□□□□□□□□□□□□□□□□GSM□□□□□3.7□□□

[illegible]BTS[illegible]BSC[illegible]MSC[illegible]HLR[illegible]VLR[illegible]AuC[illegible]GSM[illegible]



[illegible]3.7 [illegible]GSM[illegible]

3.1.3 [illegible]“[illegible]”——GSM[illegible]

[illegible]3.7[illegible]BSC[illegible]

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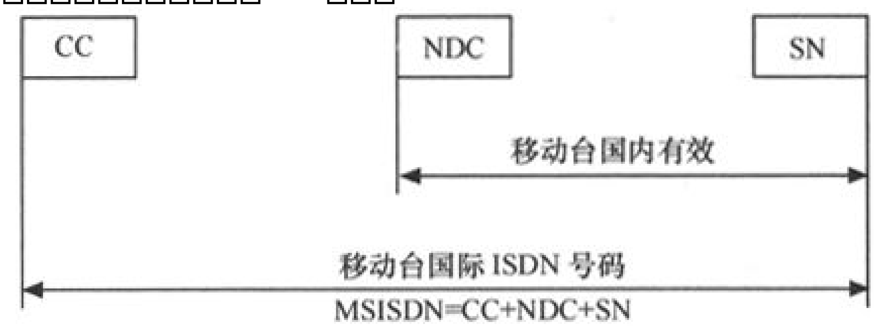
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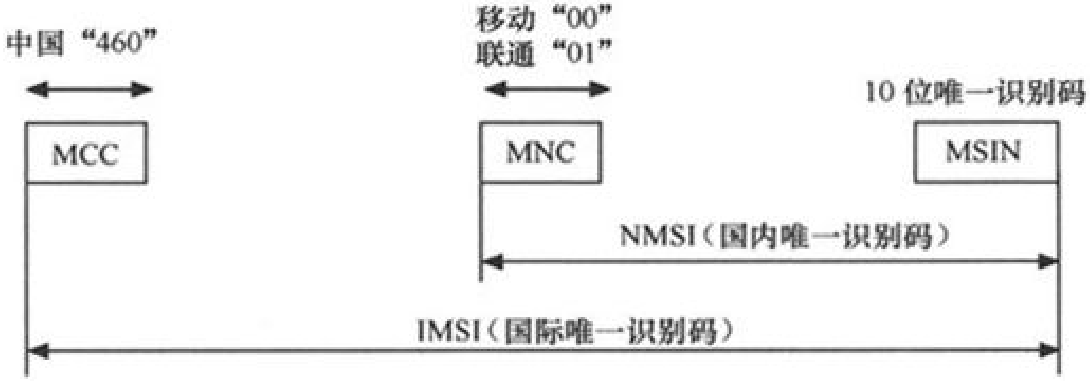
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MSISDN□IMSI□□□SIM□□□□□□IMSI□□□□□□□

□□3.9□□□IMSI□□□□□□

$$IMSI=MCC+MNC+MSIN$$



□3.9 IMSI□□□□

MCC□Mobile Country Code□□□□□□□□□□3□□□□□□□□□□□□□□□□□□□□□□□□□□460□

MNC□Mobile Network Code□□□□□□□□□2□□□□□□□□□□□□□□□□□□□□□□□□□□GSM PLMN□□00□□□□□□GSM PLMN□□01□

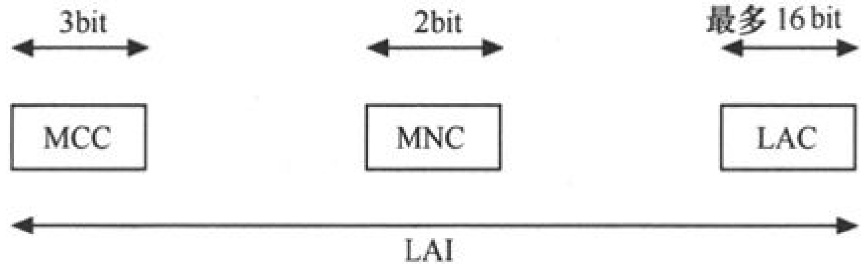
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3□□□□□□□□LAI□Location Area Identity□

LAI□□MSC□□□□□□□□□□□□□3.10□□□□□□□□□□□□□□□□□□3.7□□□1□□□N□□□□□□□□□□□□□□□□□□□□□□BSC□□□□LAI□□□□□□□□□□□□□□□□

$$LAI = MCC + MNC + LAC$$

MCC□□□□□□□□□□□□□□□□□□□IMSI□□□3□□□□



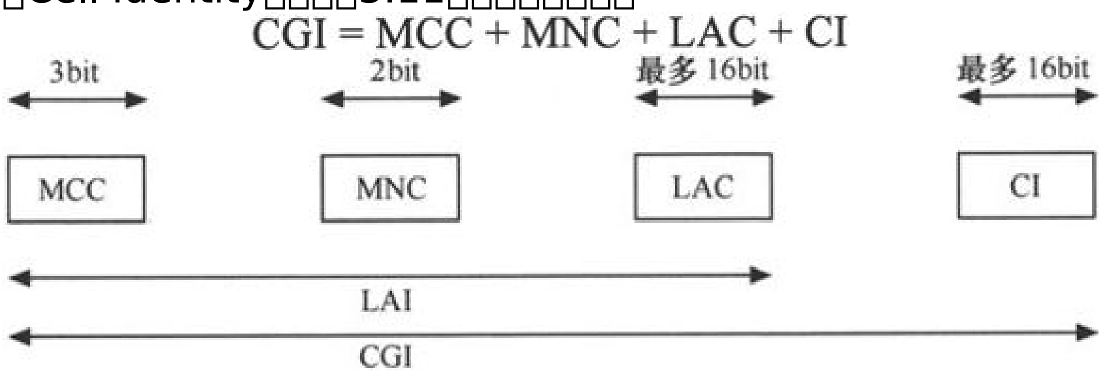
□3.10 LAI□

MNC□□□□□□□□□□□□□GSM□□□IMSI□□MNC□

LAC□□□□□□□□□□□□□GSM□□□□□□□LAC□□□□□□16bit□□□□GSM PLMN□□□□65536□□□□□□□□

4□□□□□□□□□CGI□Cell Global Identifier□

□□□LAI□□□□□□□□□□□□□□□□□□□CGI□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□3□□□□□□□□□□□□□□□□□□LAI□□□□□□□□□□□□CI□Cell Identity□□□□3.11□□□□□□□□



□3.11 CGI□

MCC□□□□□□□□□□□□□□□□□□

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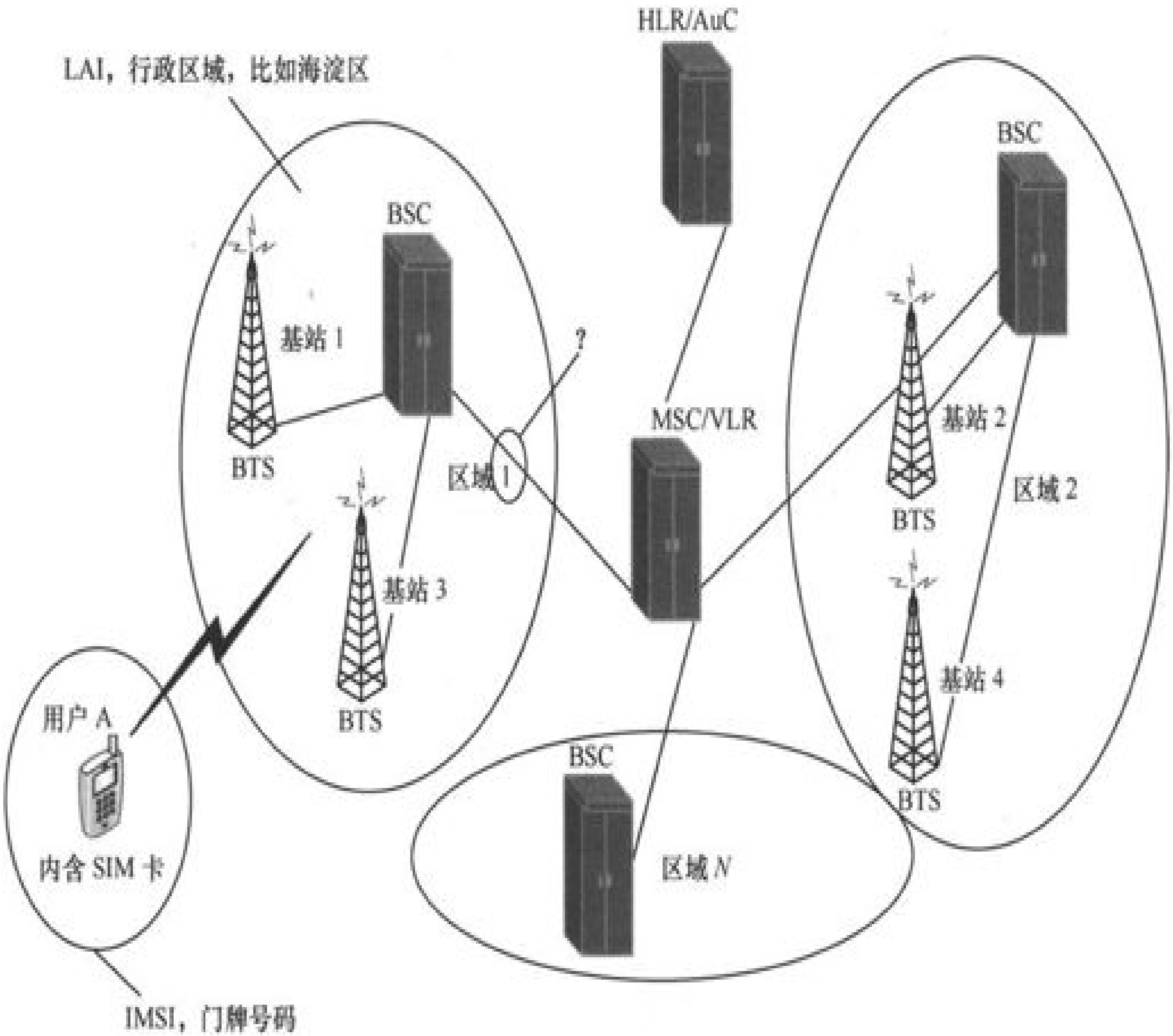
LAC□□□□□□□□□□GSM PLMN□□□□□65536□□□□□□□□□

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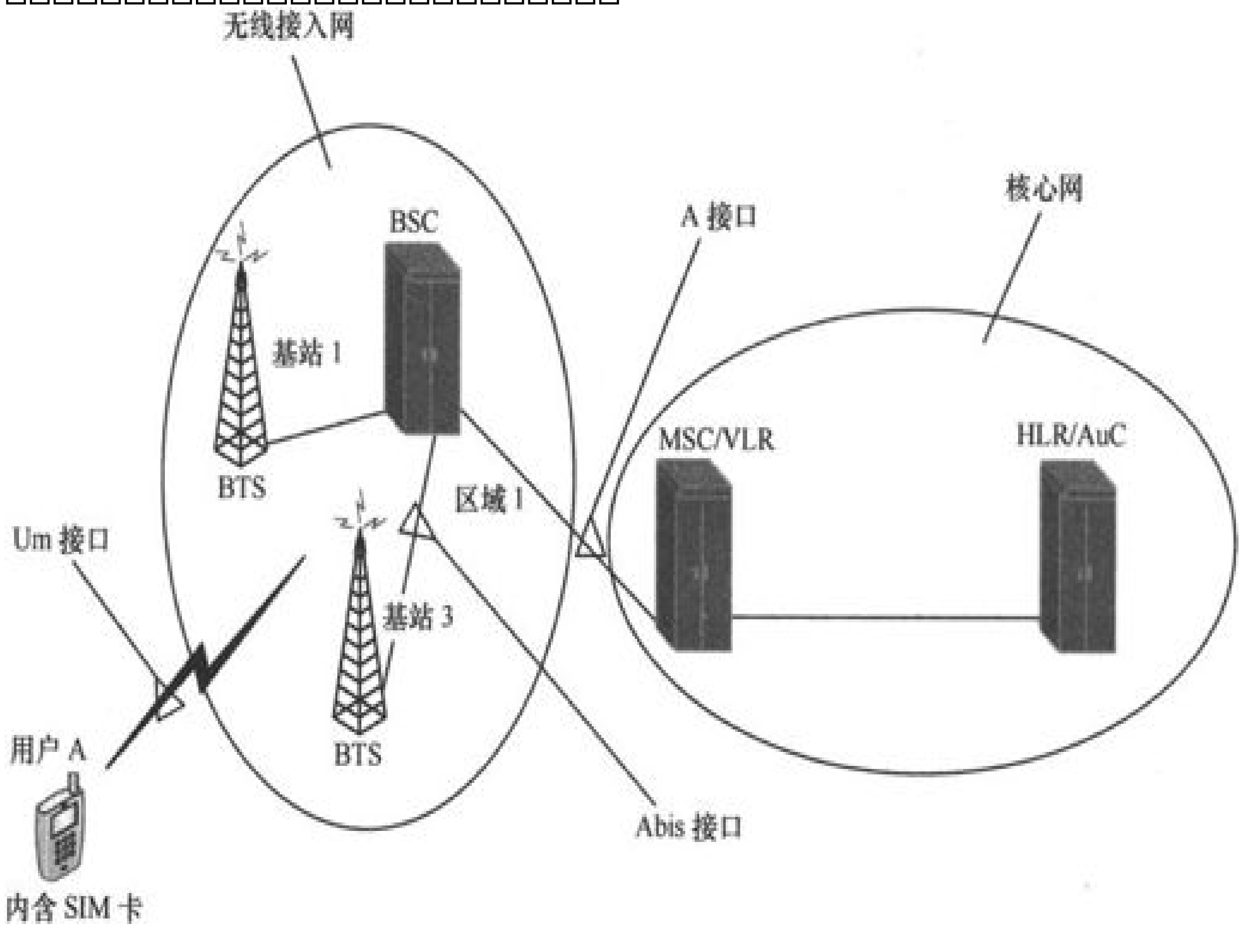
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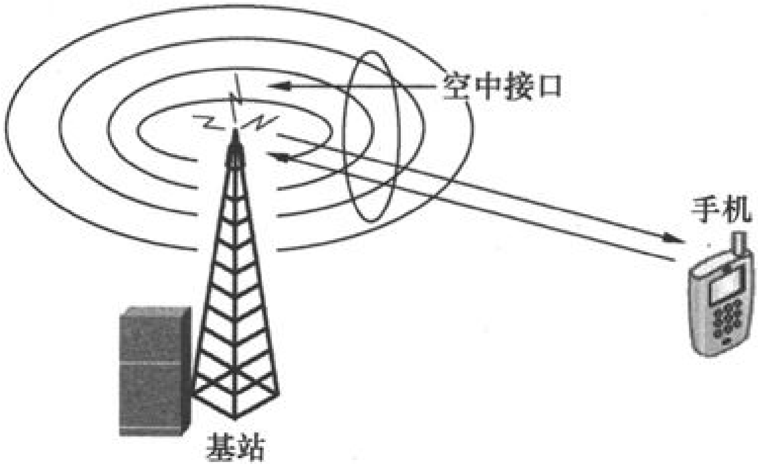
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□3.13 Um□□□Abis□□□A□□

<u>3.2 GSM□□□□□□——□□□□□4□□□</u>

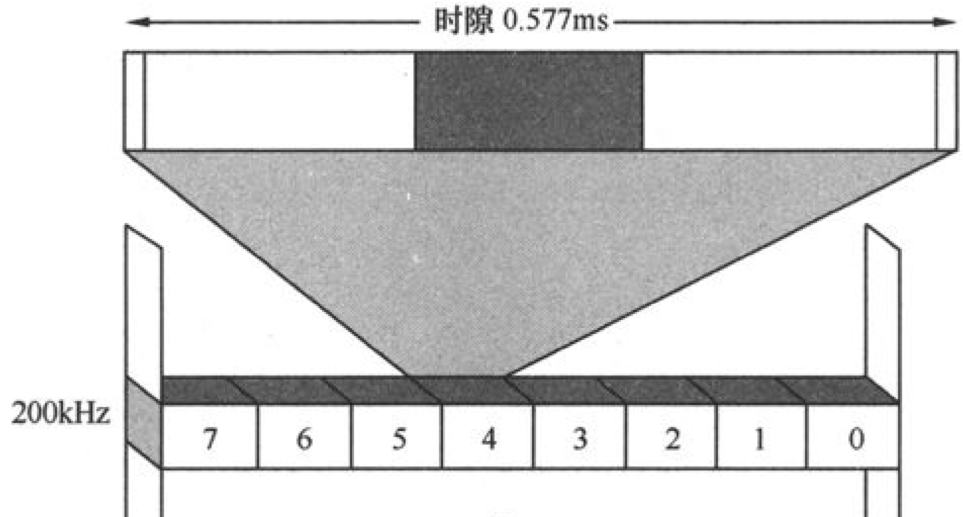
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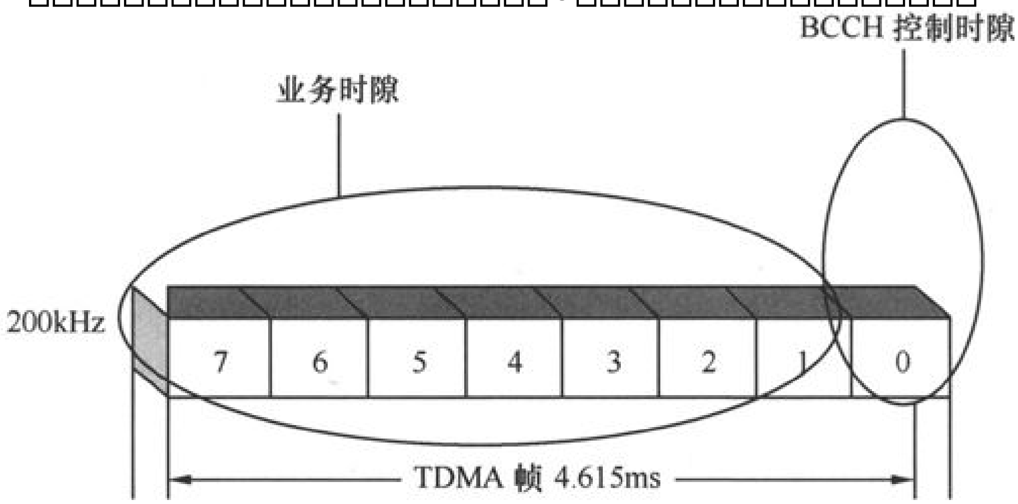
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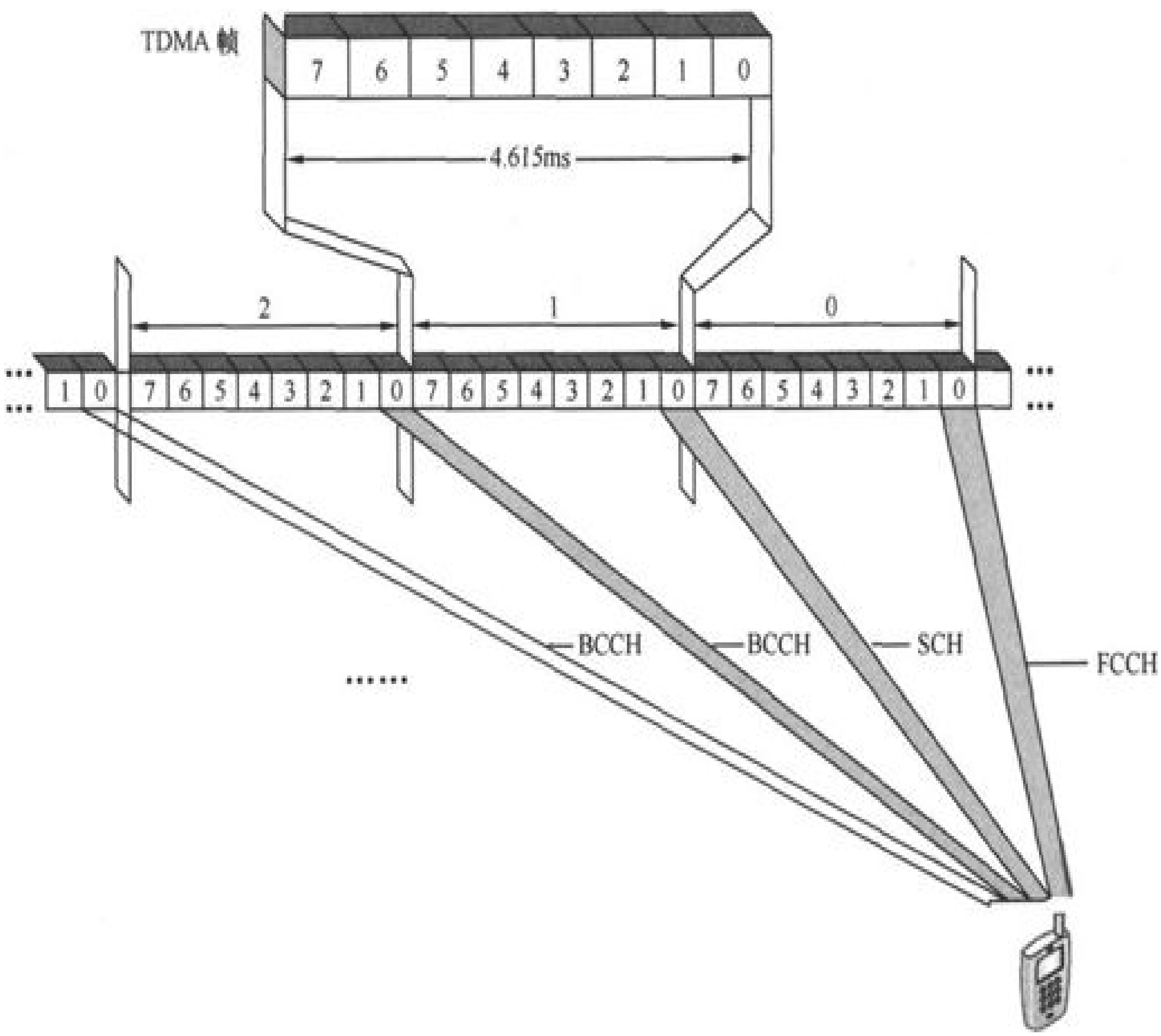
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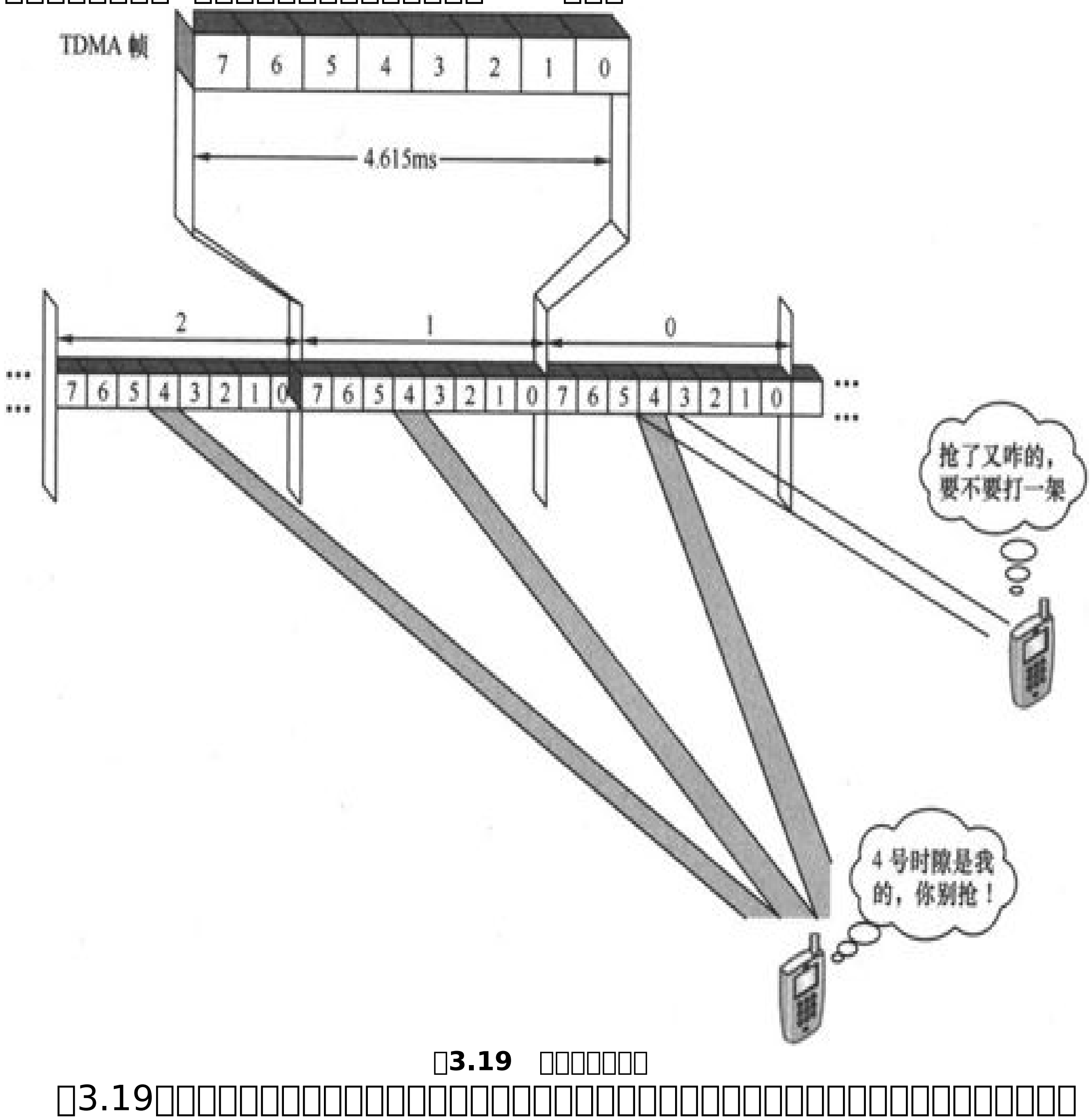
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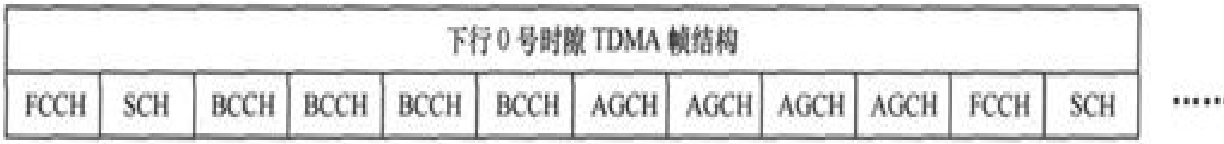


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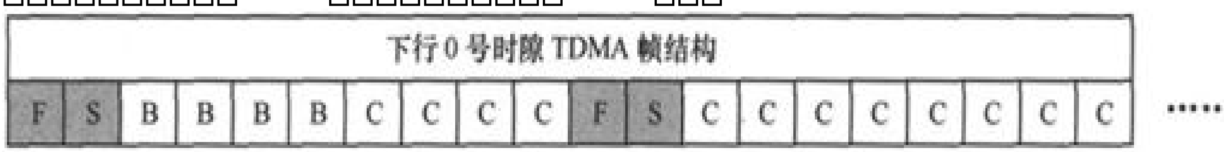


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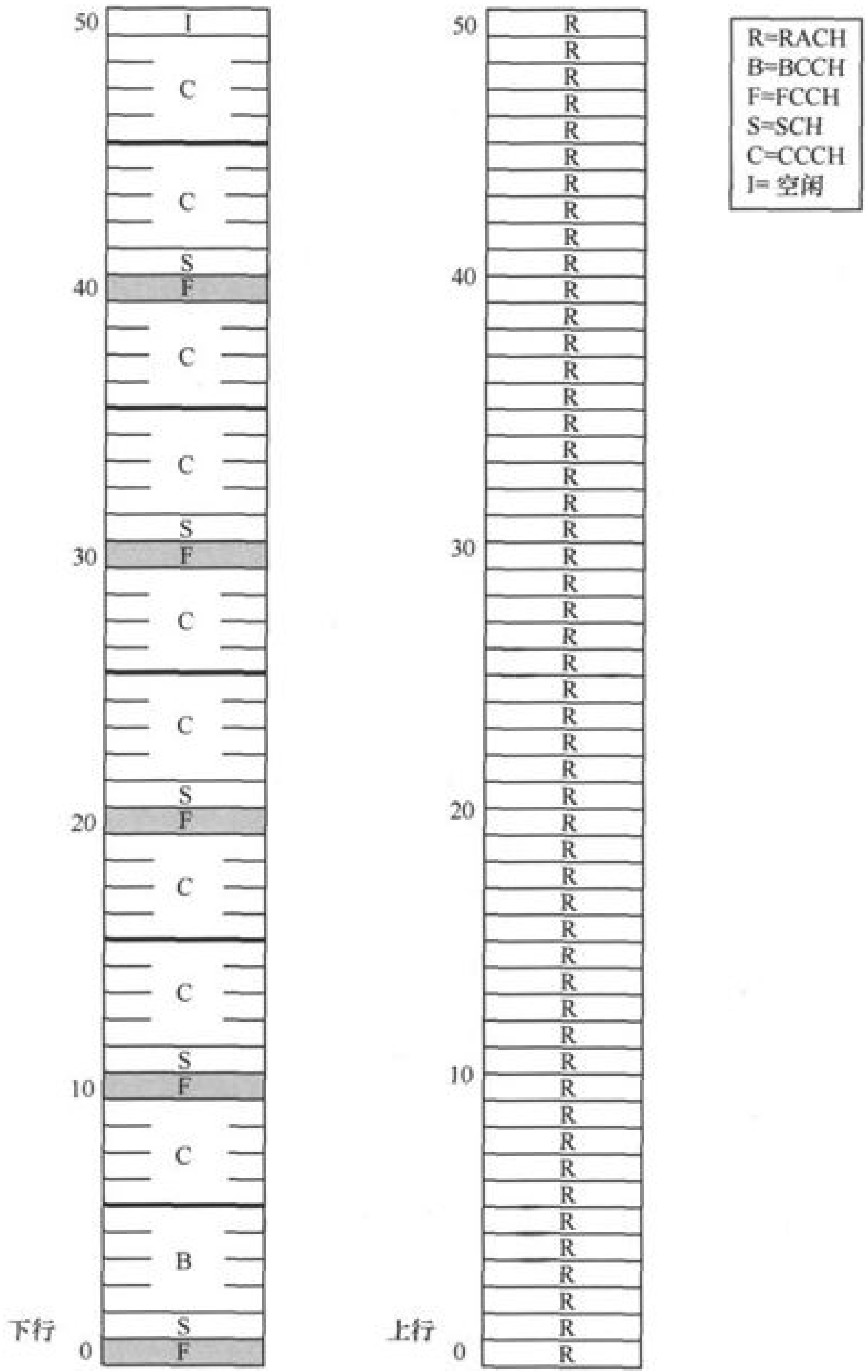


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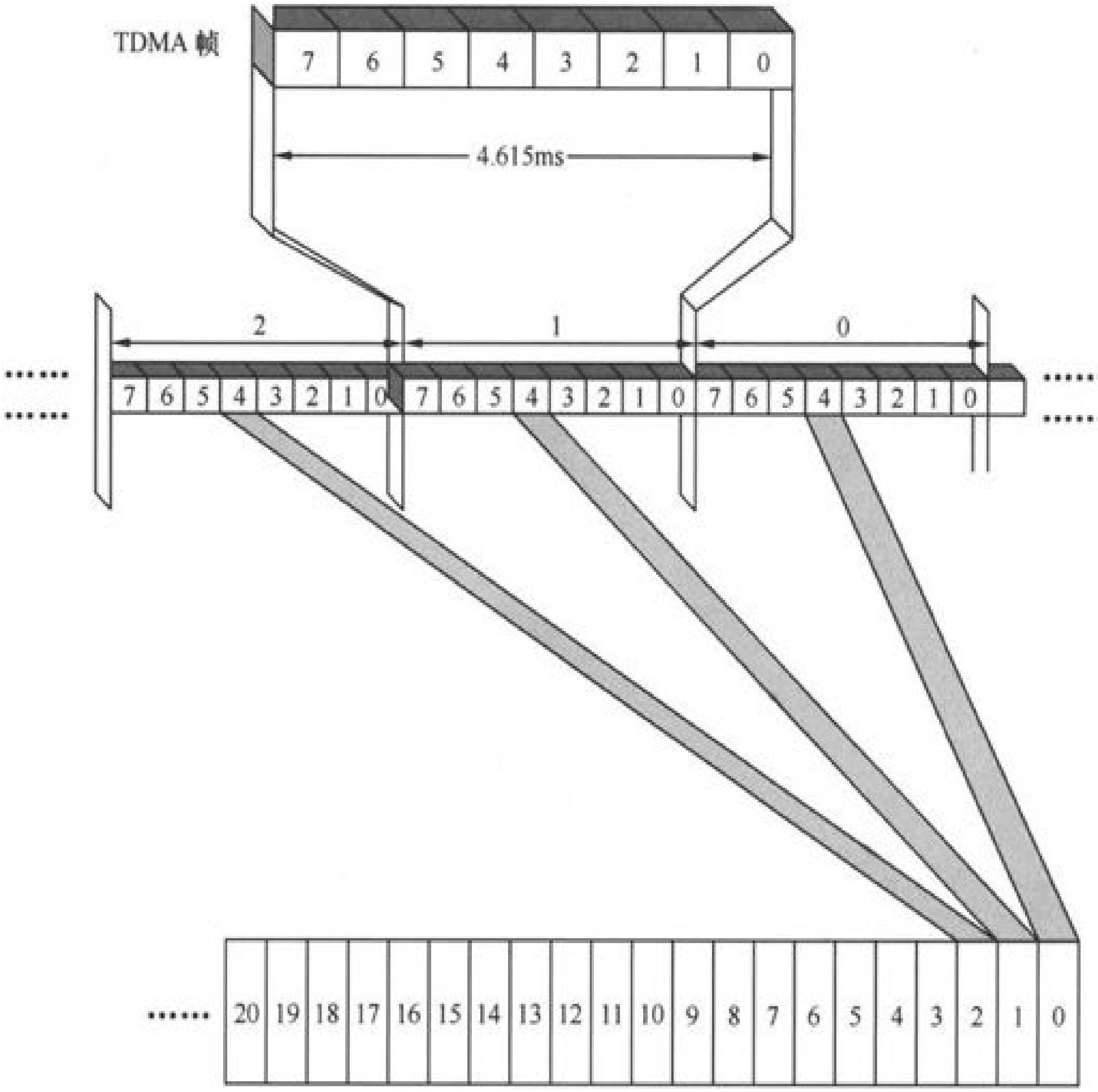
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3.2.4

3.2.2 RACH AGCH TCH Traffic CHannel 1 1 2 7 1 TCH TCH 3.23



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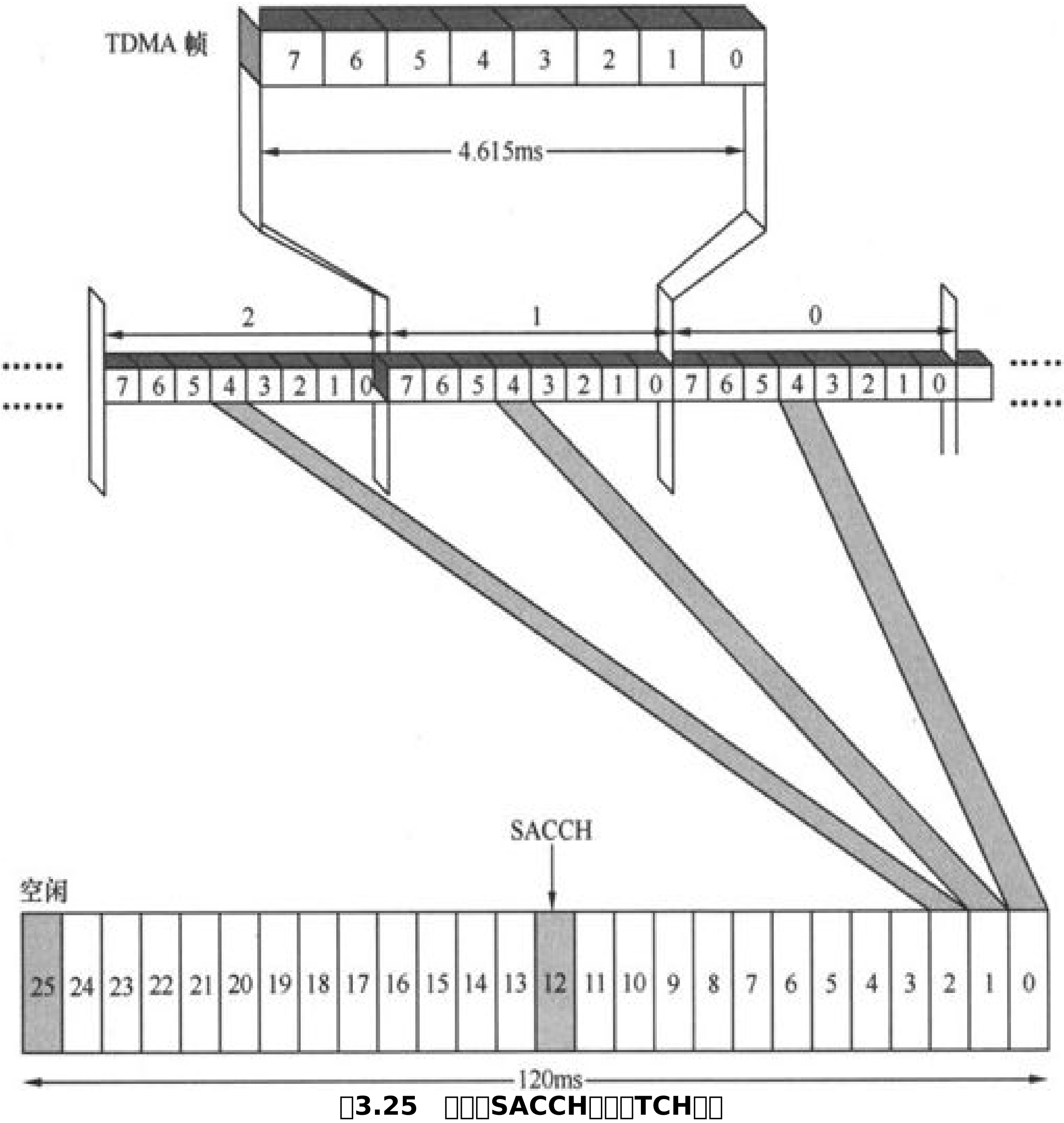
□□SDCCH□Stand-Alone Dedicated Control CHannel□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□1□□□□□□□8□□□□□3.24□□□

下行信道 1 号时隙的 8 个 SDCCH							
SDCCH1	SDCCH2	SDCCH3	SDCCH4	SDCCH5	SDCCH6	SDCCH7	SDCCH8

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4.615ms□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□SACCH□□□□□□□
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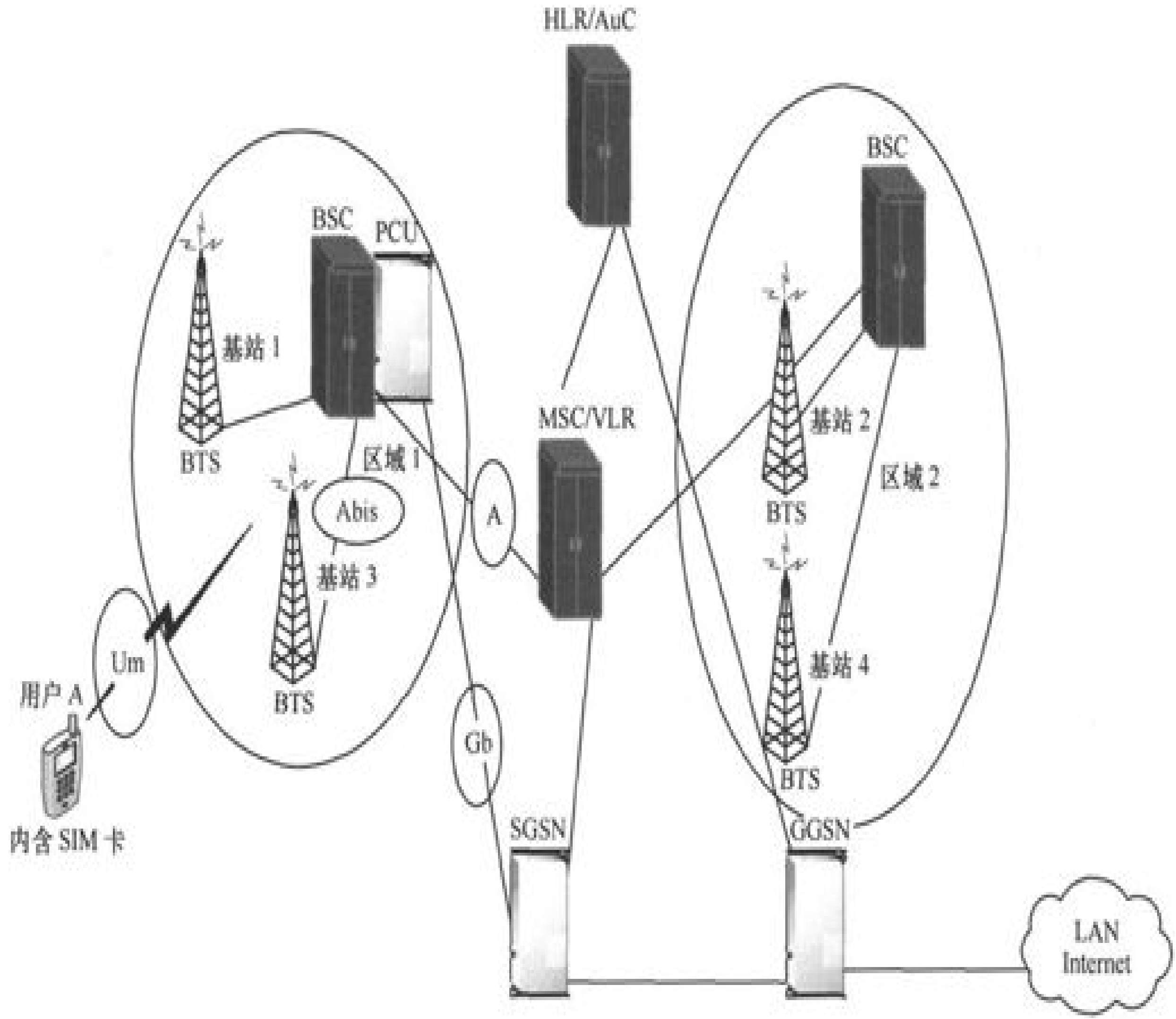
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PCU□Package Control Unit□□□□□□□□□BSC□□□□□□□□□□□□□□
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SGSN□Servicing GPRS Support Node□GPRS□□□□□□□□□□□□□
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GGSN□Gateway GPRS Support Node□□□GPRS□□□□□□□□□□□
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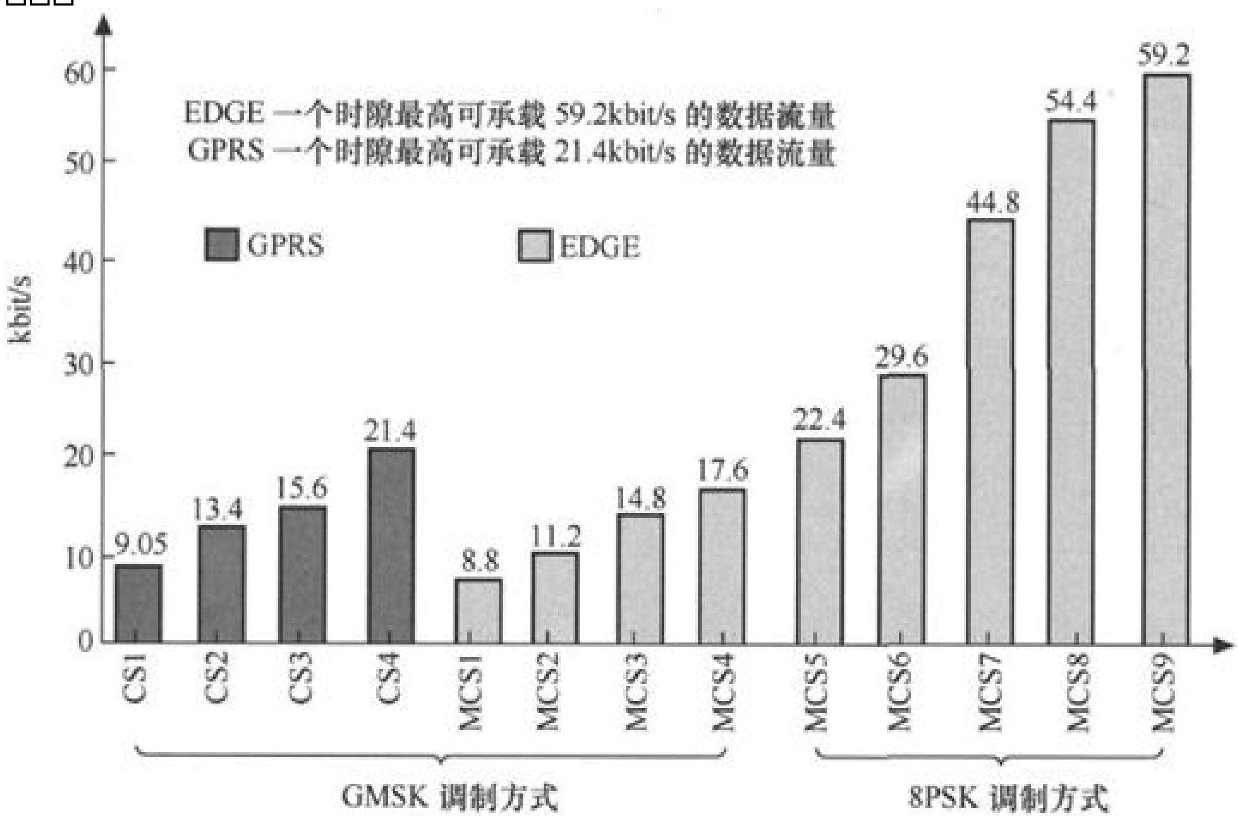
组　别	名　称	对应 GSM 信道	方　向	功　能
PCCCH	PRACH	RACH	上行	随机接入
	PPCH	PCH	下行	寻呼
	PAGCH	AGCH	下行	允许接入

续表

组别	名称	对应 GSM 信道	方向	功能
PBCCH	PBCCH	BCCH	下行	广播
PTCH	PDTCH	TCH	下行和上行	数据
	PACCH	SACCH	下行和上行	随路控制

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EDGE□□□□□□□□□□GPRS□□□□□□□□□□□□□□□□□□□□□□□□3.27□□□



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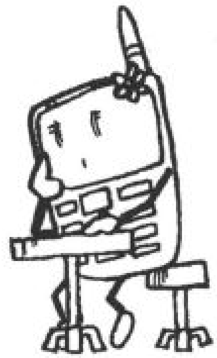
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Chapter 4
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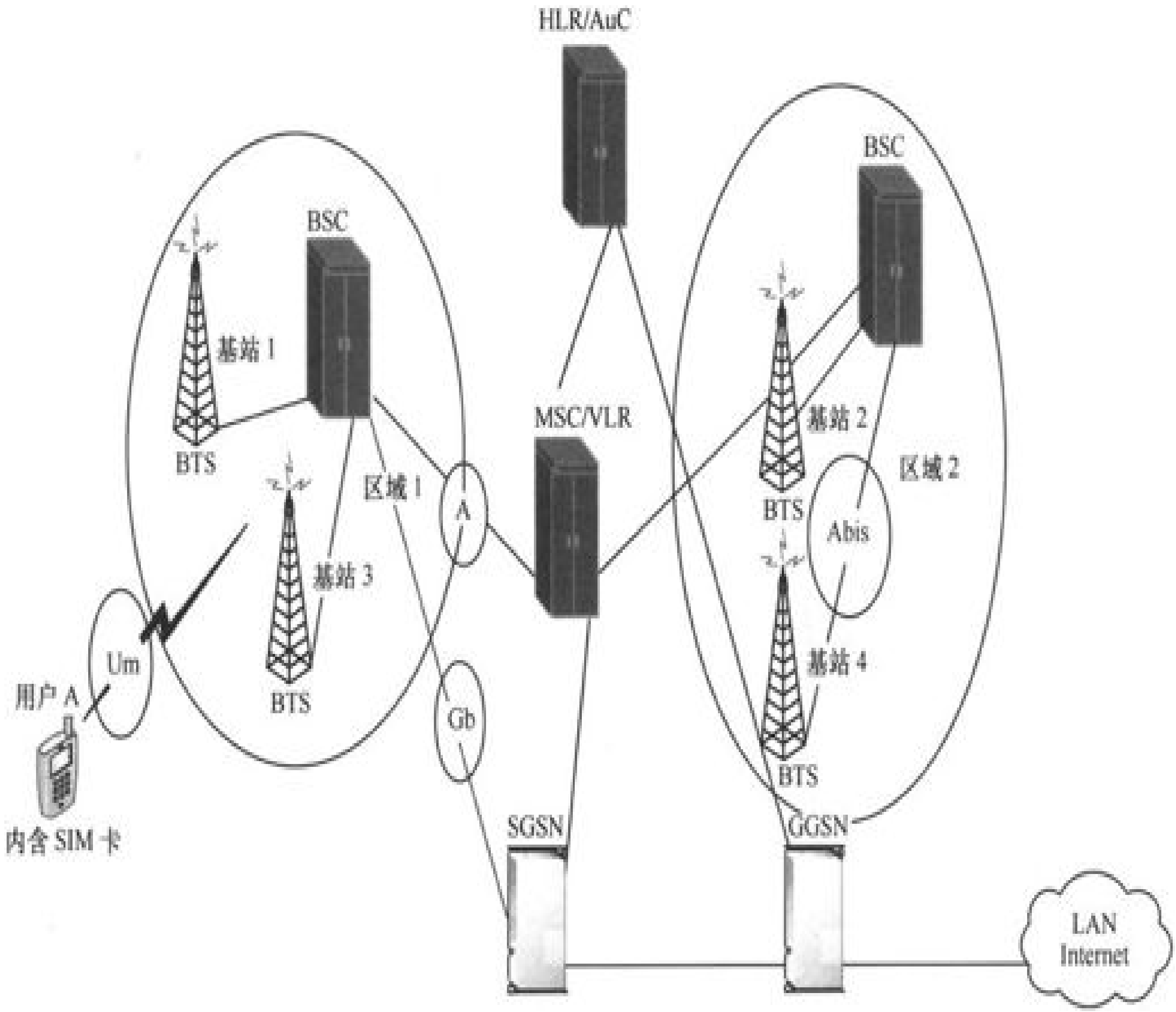
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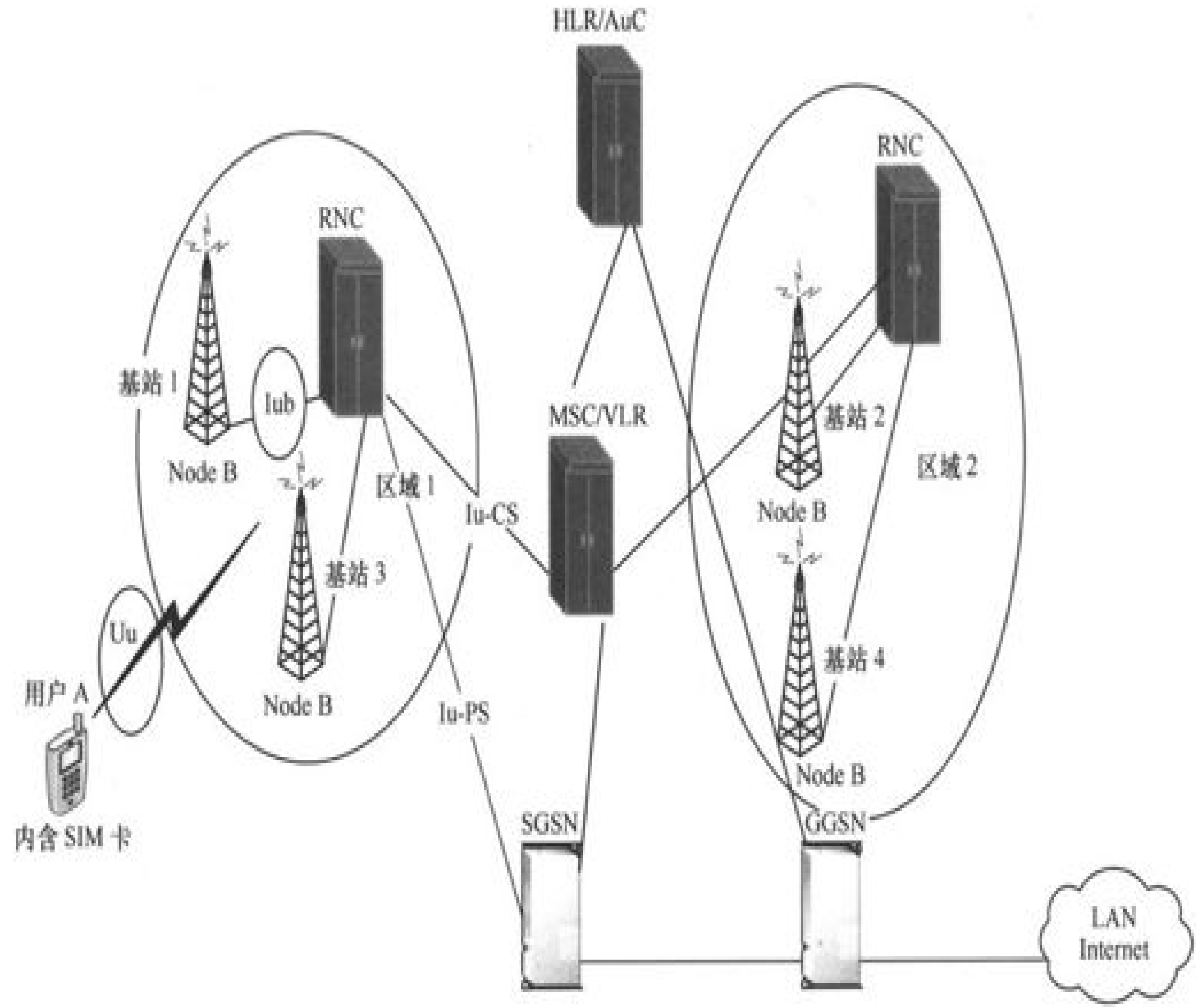
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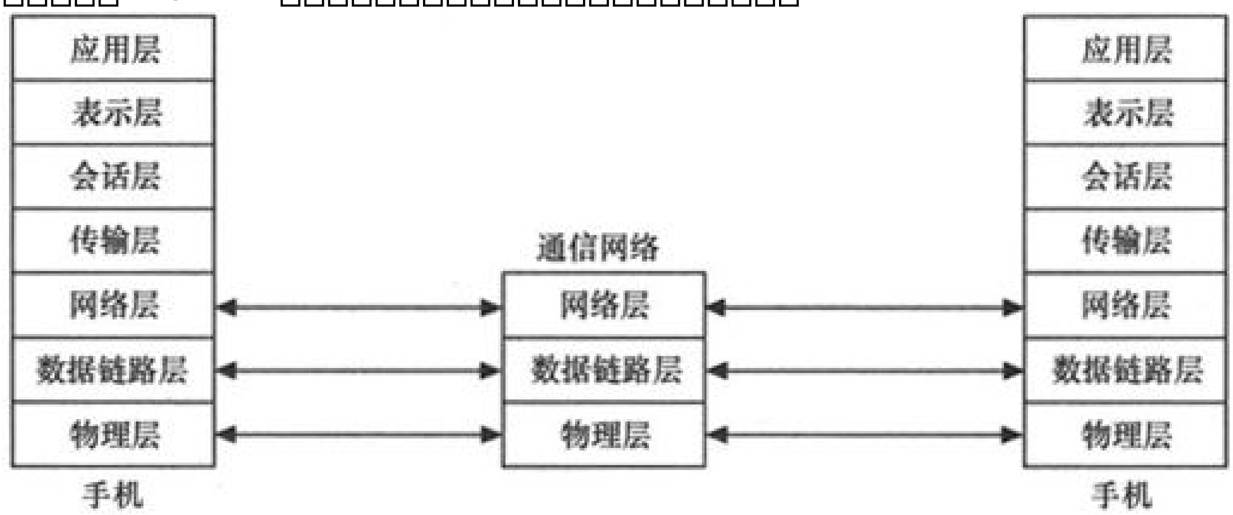
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$$C = B\,\mathrm{lb}\left(1 + \frac{S}{N}\right)$$

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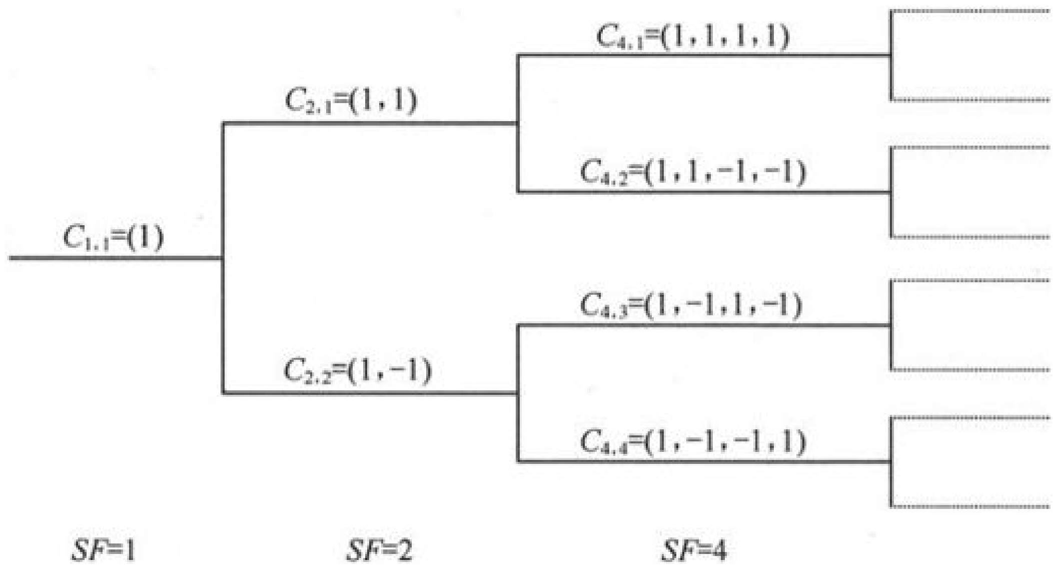
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[illegible]Walsh[illegible]OVSF[illegible]4.4[illegible]

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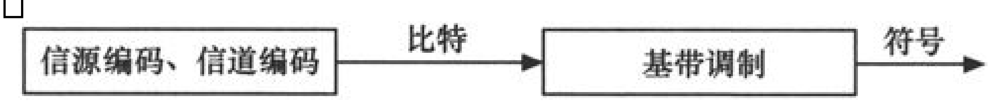
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[illegible]512[illegible]512 [illegible]512[illegible]

1[illegible]

[illegible]“[illegible]”[illegible]GMSK[illegible]QPSK[illegible]16QAM[illegible]“[illegible]”[illegible] QPSK[illegible]4[illegible]16QAM[illegible]GSM[illegible] 4.5[illegible]



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[illegible]4.5[illegible]“[illegible]”[illegible]GSM[illegible] 200kHz[illegible]5MHz[illegible]WCDMA[illegible] [illegible]2.2.2[illegible] [illegible]Walsh[illegible]OVSF[illegible]CDMA[illegible] [illegible]WCDMA[illegible]cdma2000[illegible]TD-SCDMA[illegible] [illegible]OVSF[illegible]“[illegible]”[illegible]4.6[illegible]



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3□□□□□□□

□□□□□□□□□□□GSM□□□□□□□□□□□□□□□□□□□□CDMA□□□□□□□□□□□CDMA□□3□3G□□□□□□□□□□□□□□□□□“□□□□□□□□□□”□□□

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$$C = B\,\mathrm{lb}\left(1+\frac{S}{N}\right)$$

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WCDMA, Wideband Code Division Multiple Access

OVSF

OVSF

4.2.2 ——

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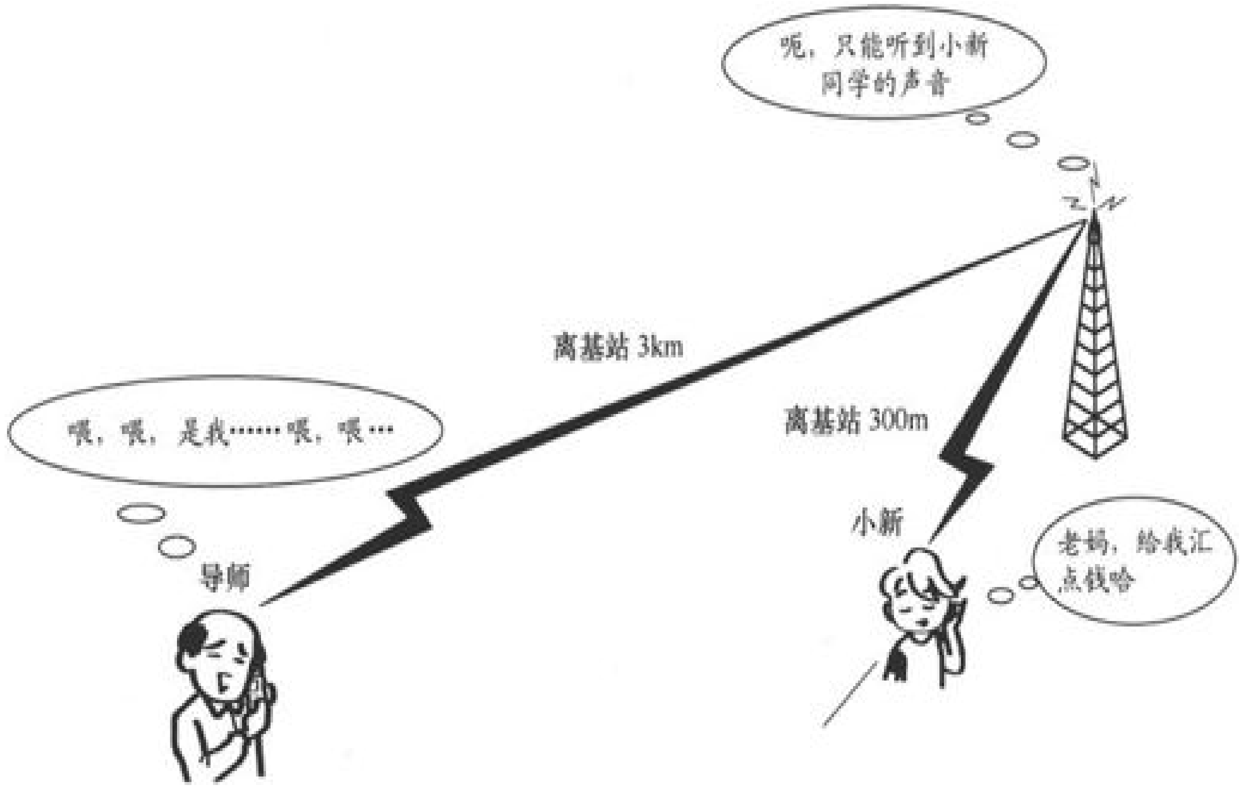
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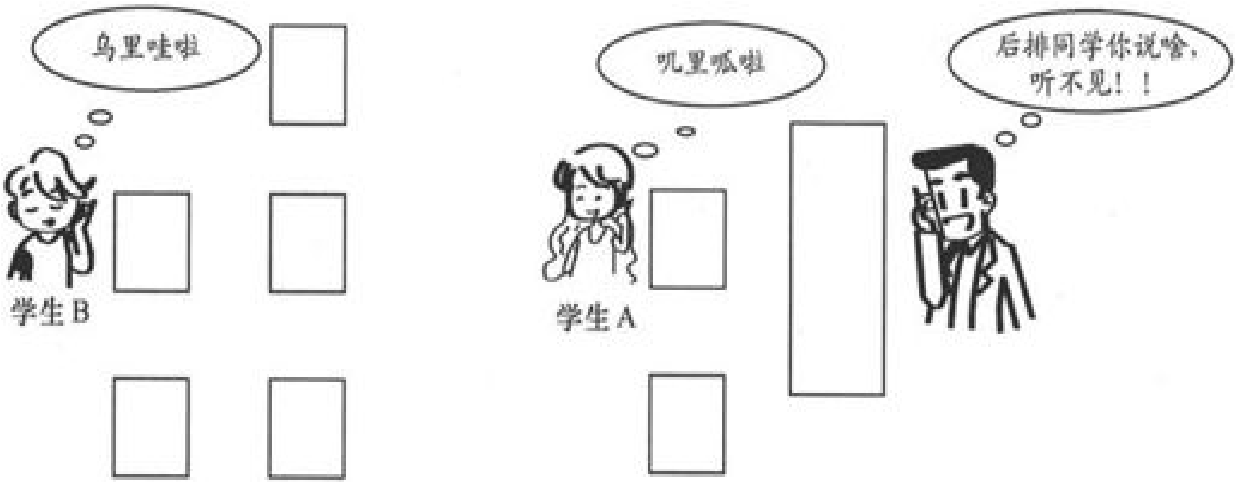


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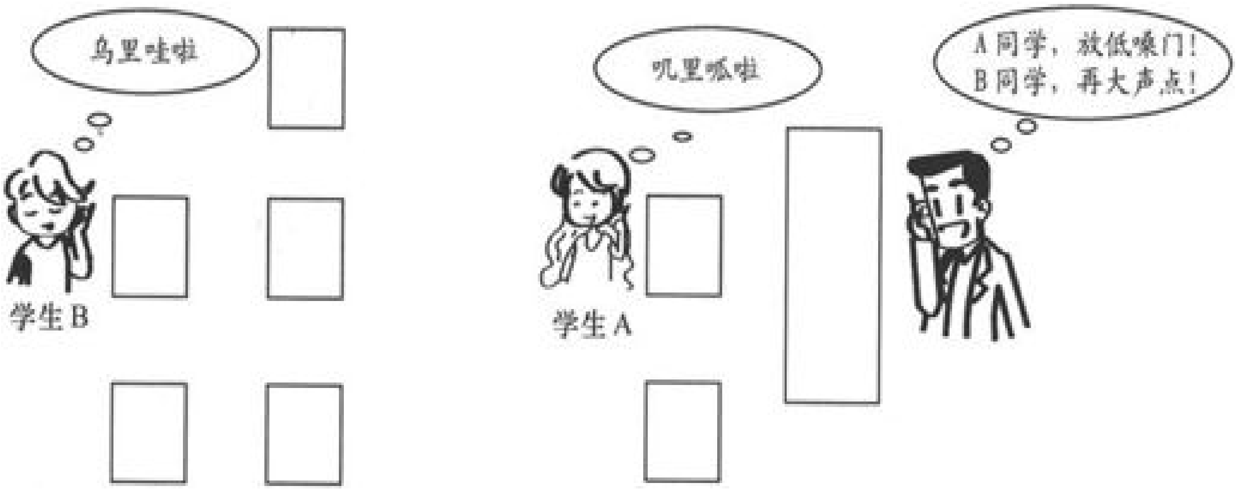
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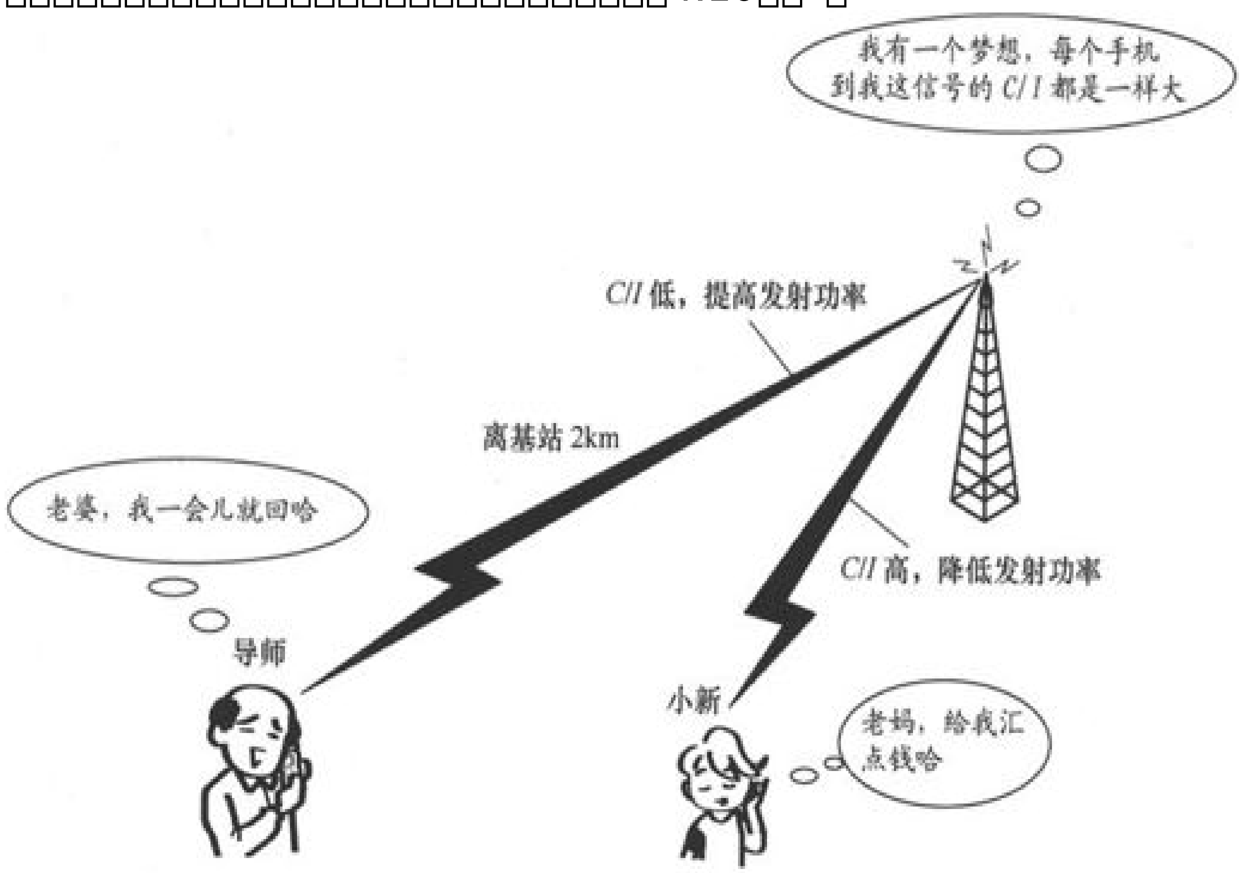
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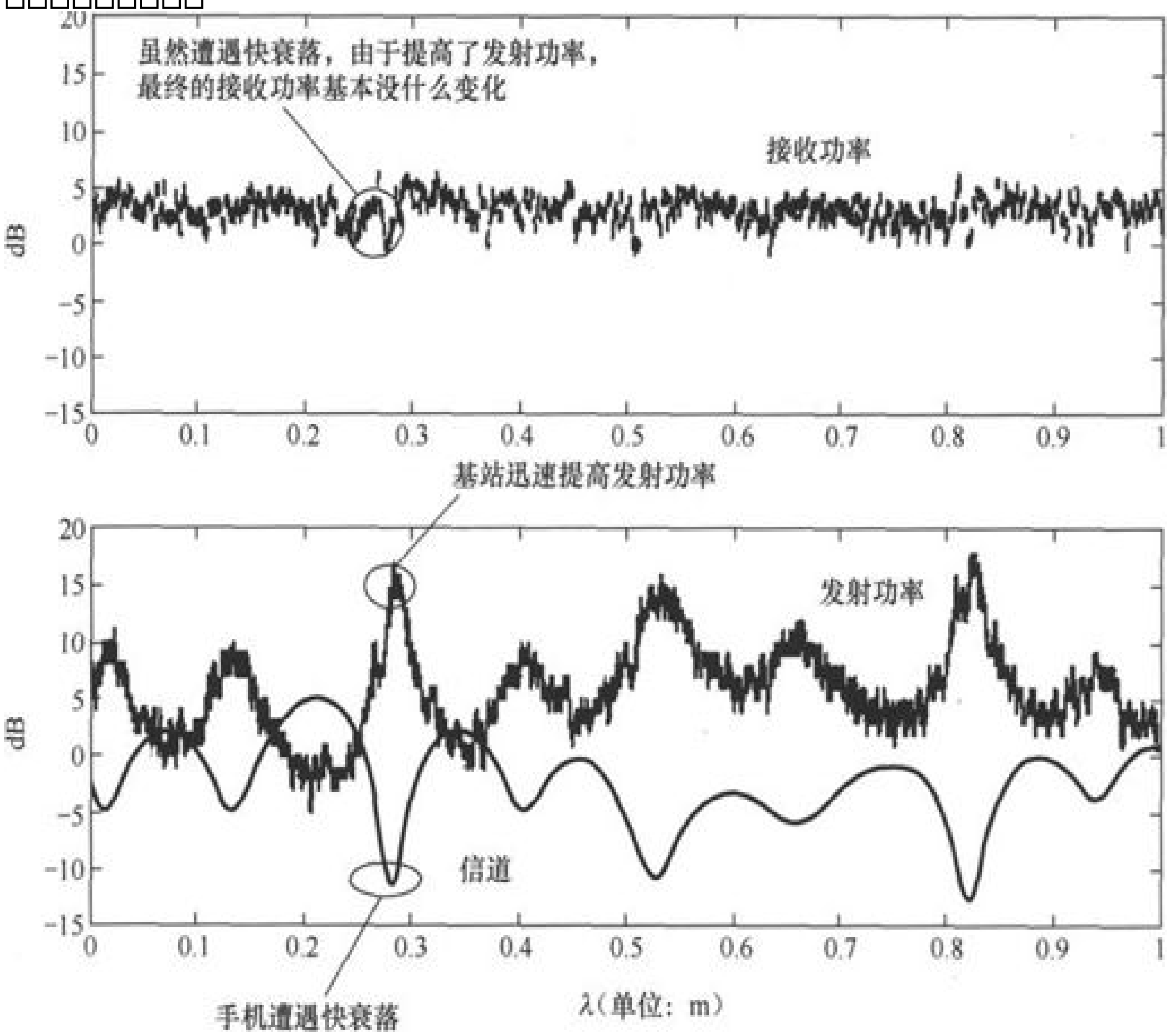
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□GSM□□□□□□□□□□□□GSM□□CDMA□□

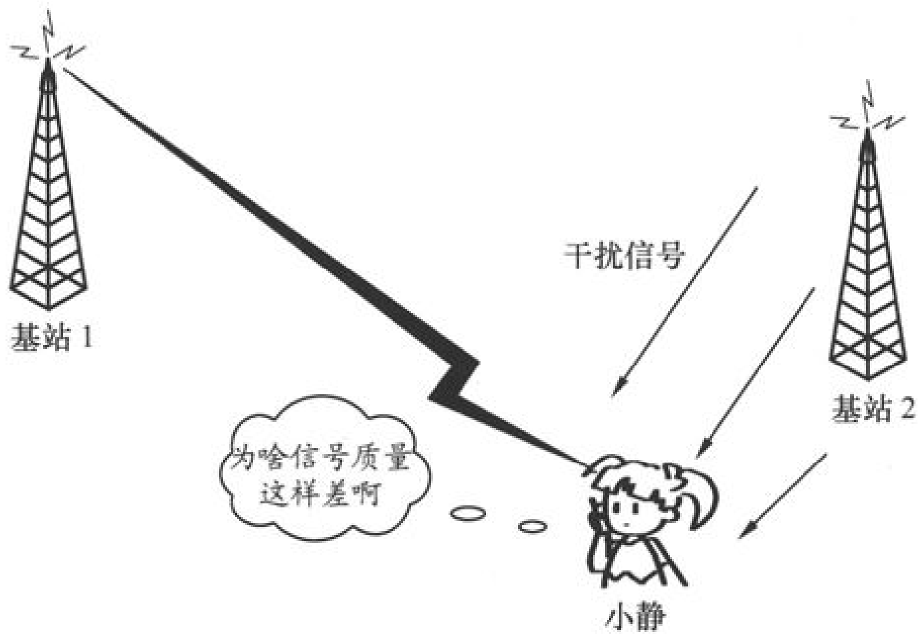
WCDMA□□□□□□□□□□□□□□□□□□□□□□□GSM□□□□□□□□□□□□□□2□□□WCDMA□□□□□□□□□□□1500□□WCDMA□□□□□□□□□□□□□□□□□4.11□□□WCDMA□□□□□□□□□□□□□□□



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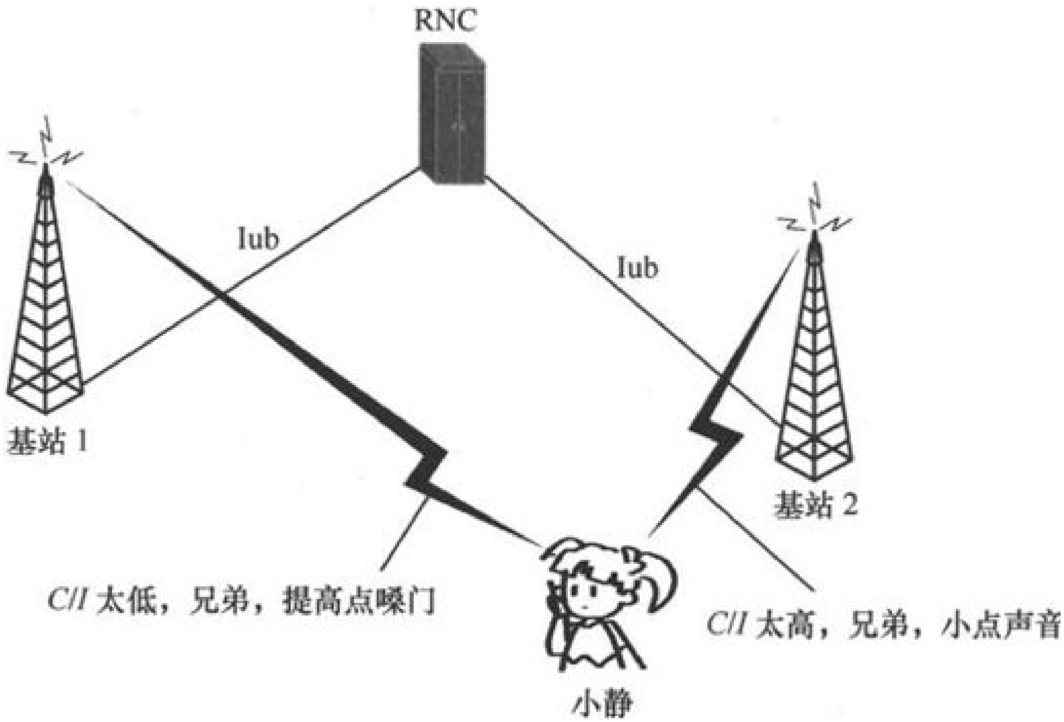
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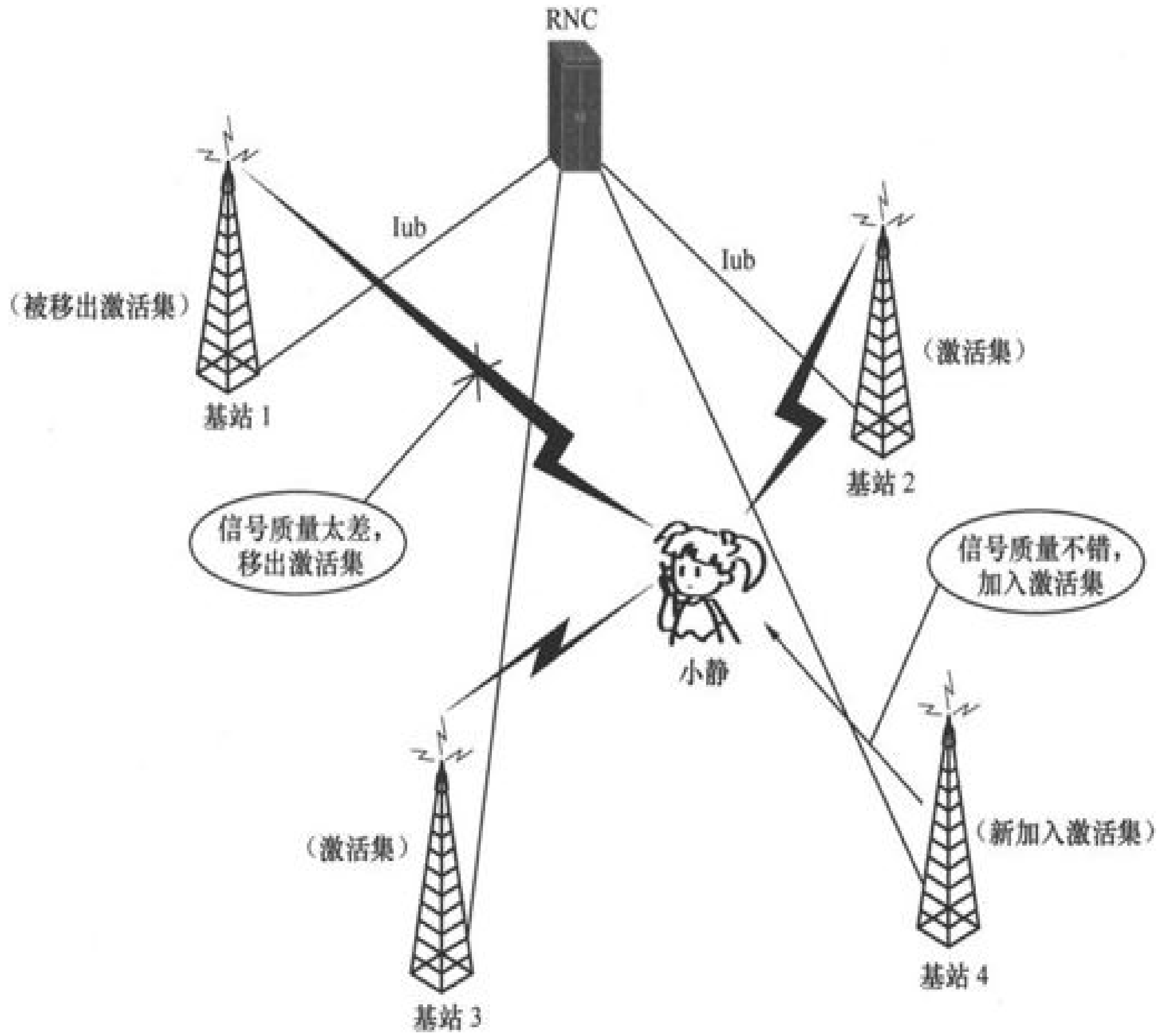
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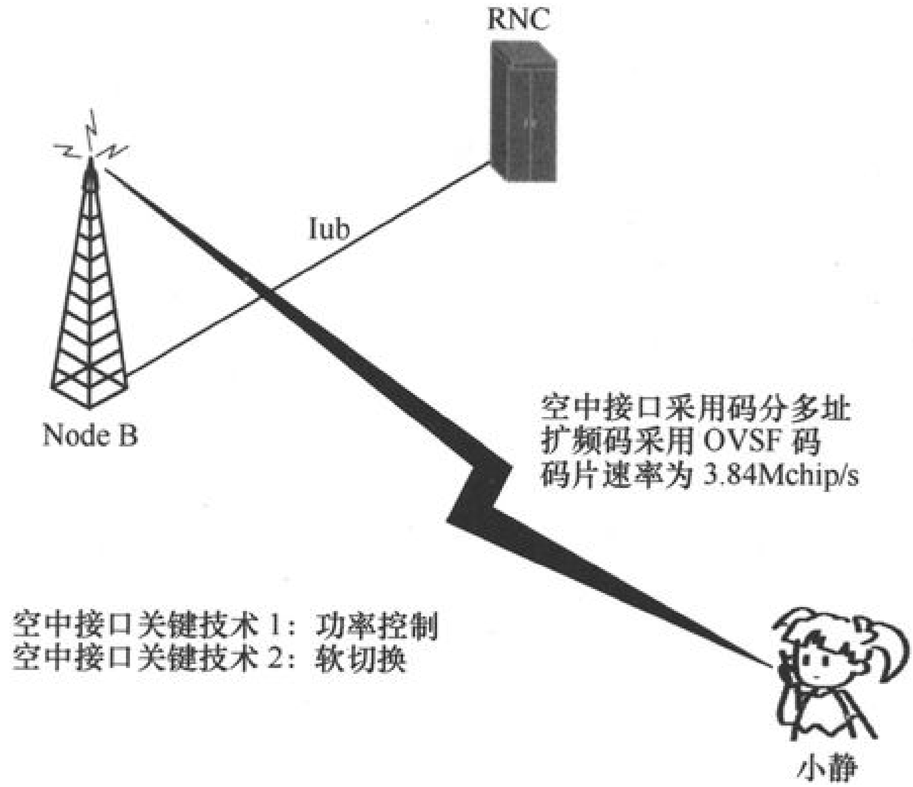
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4.2.3 [illegible]

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□4.15 RAN□□□□

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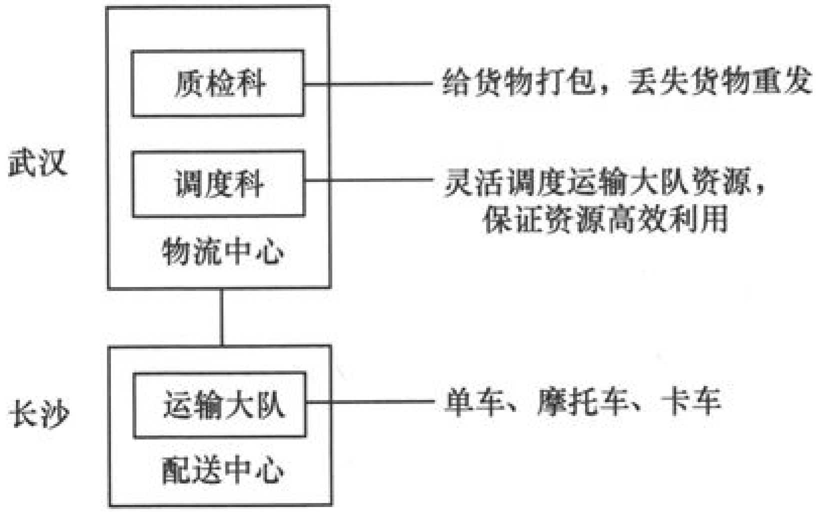
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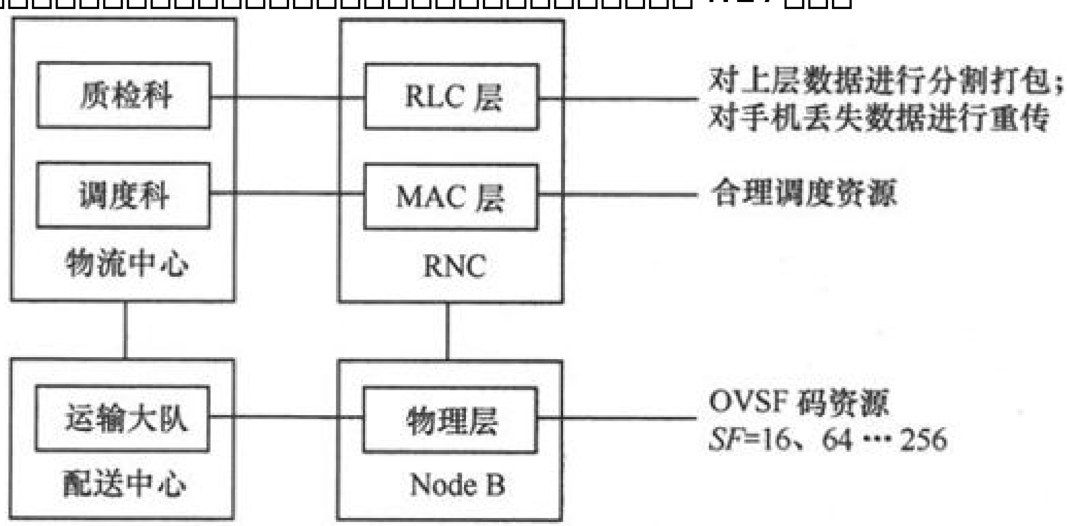
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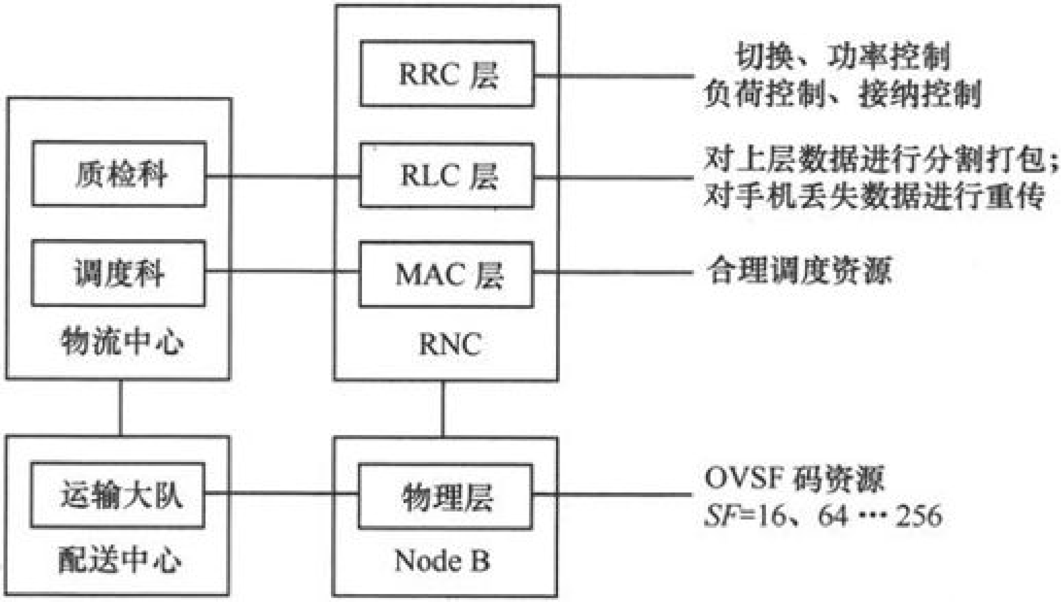
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□4.17 RAN□□□□□□□□□

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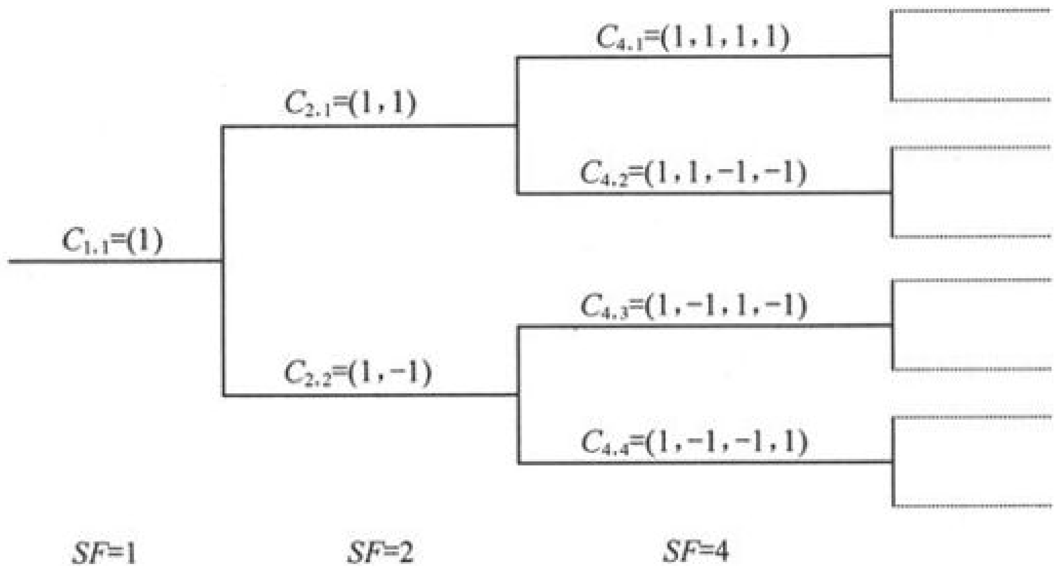
□4.18 □□□RRC□□RNC

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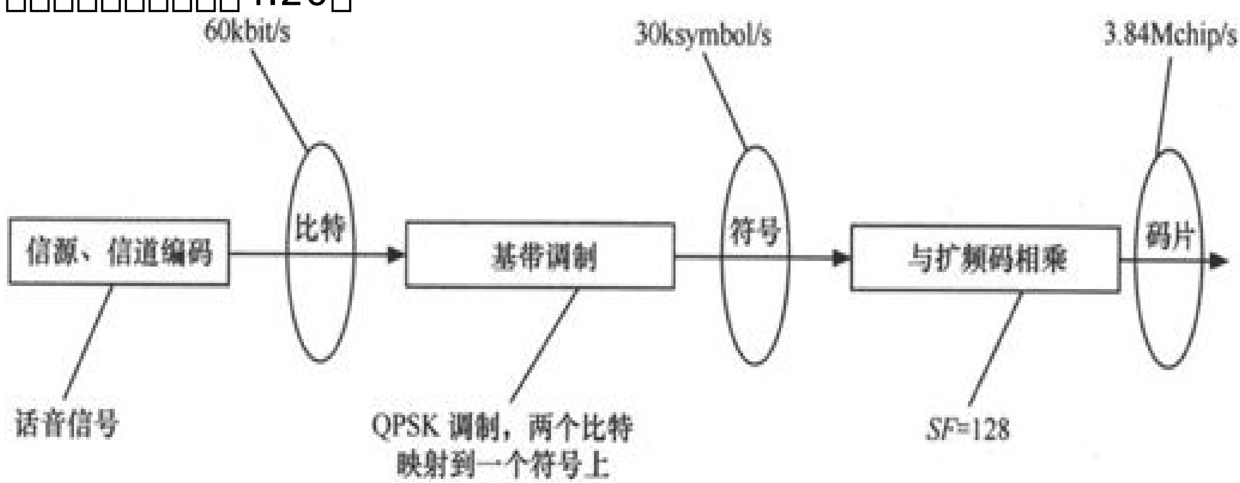
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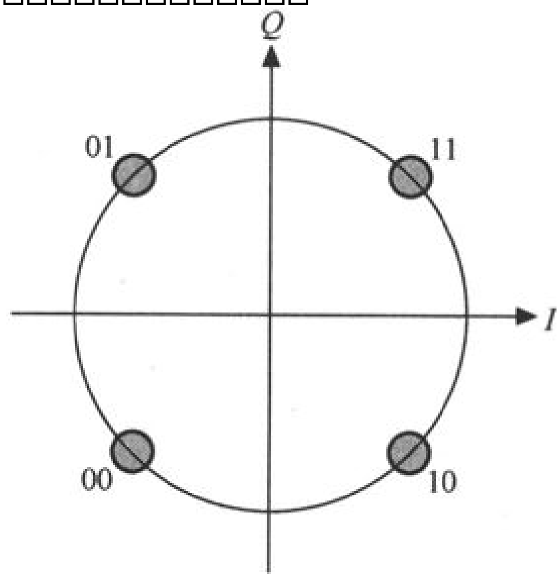
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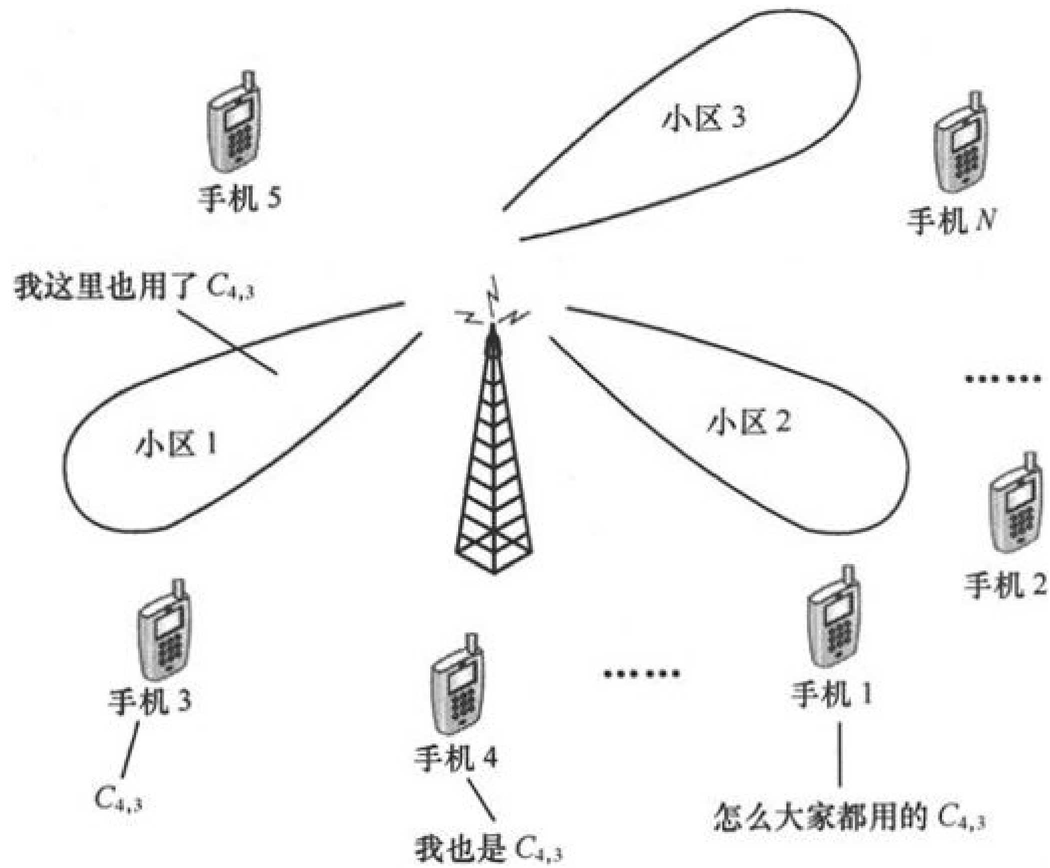
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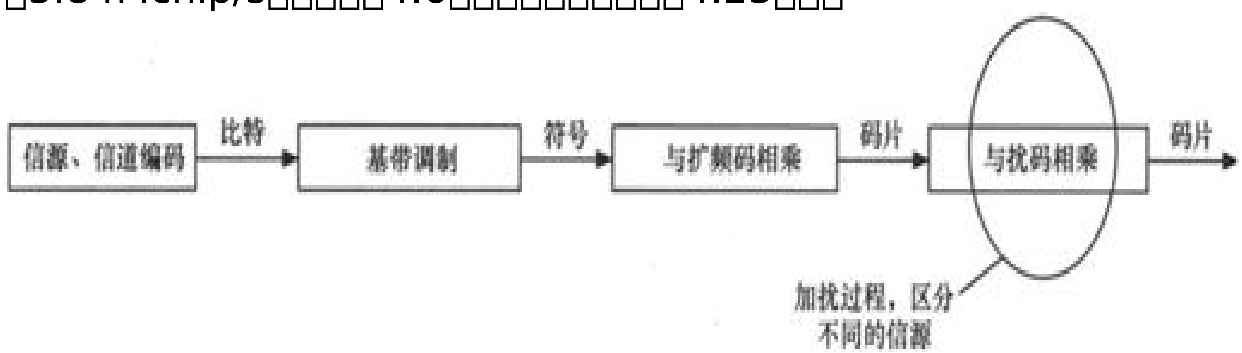
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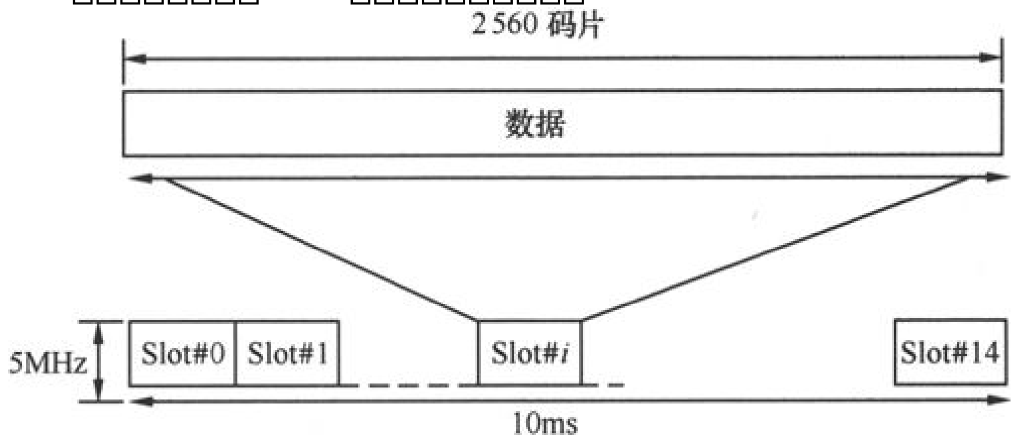
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□WCDMA□ □

4.3 □WCDMA□——□

□WCDMA□

□3.2□GSM□WCDMA□4.24□WCDMA□10ms□GSM□4.615ms□3.15□



□4.24 WCDMA□

□WCDMA□GSM□

□1□WCDMA□5MHz□GSM□200kHz□

□2□WCDMA□10ms□GSM□TDMA□4.615ms□

□3□WCDMA□15□GSM□8□WCDMA□GSM□

□WCDMA□3.84Mchip/s□3840000/100□38400□38400□15□2560□4.24□2560□

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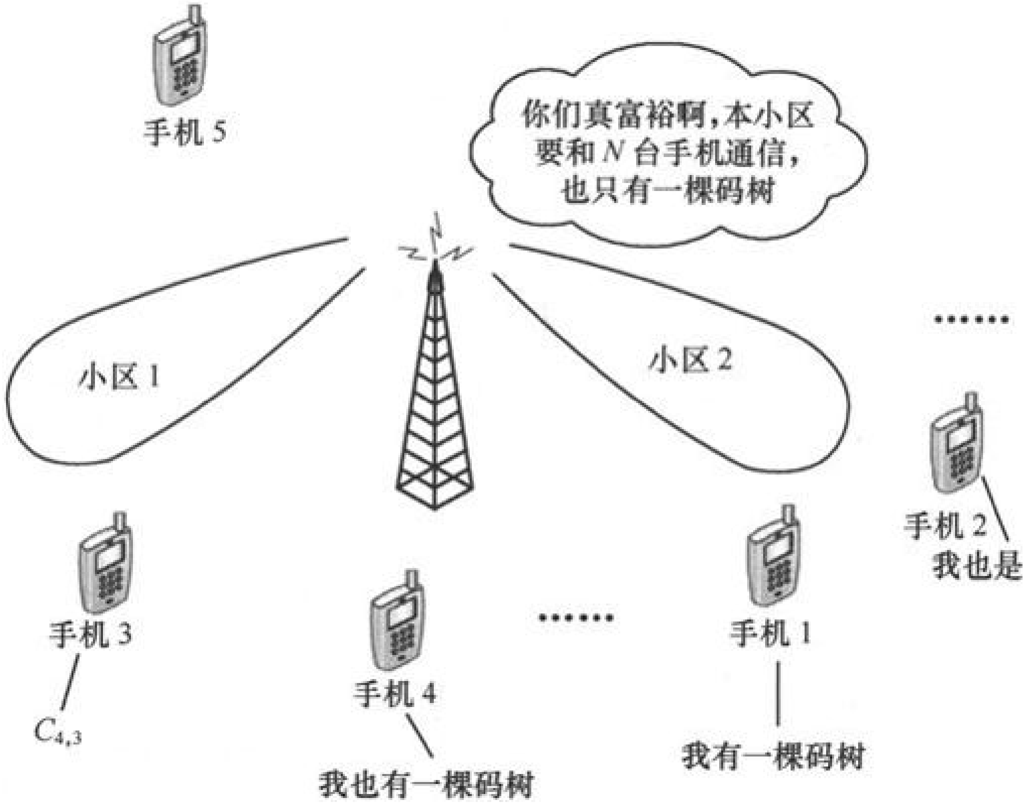
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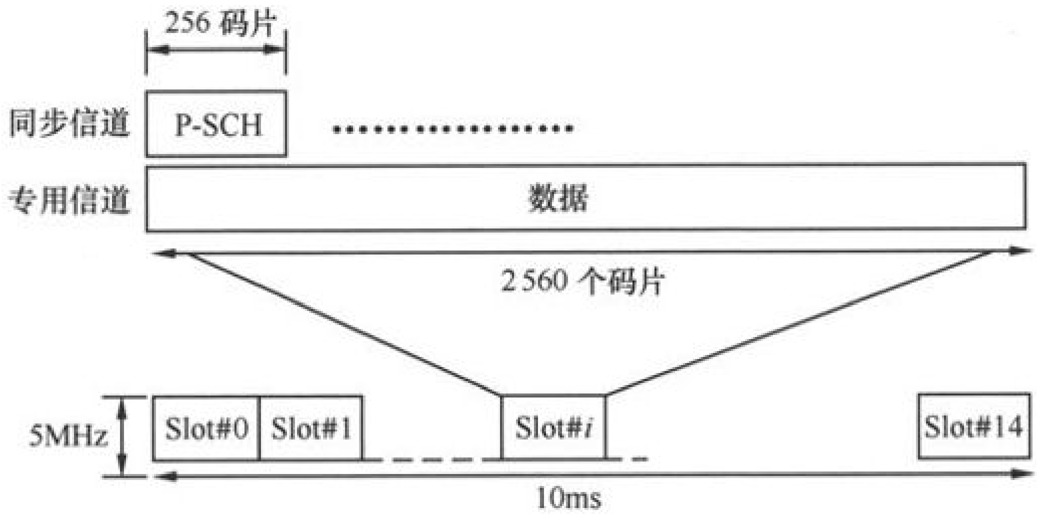
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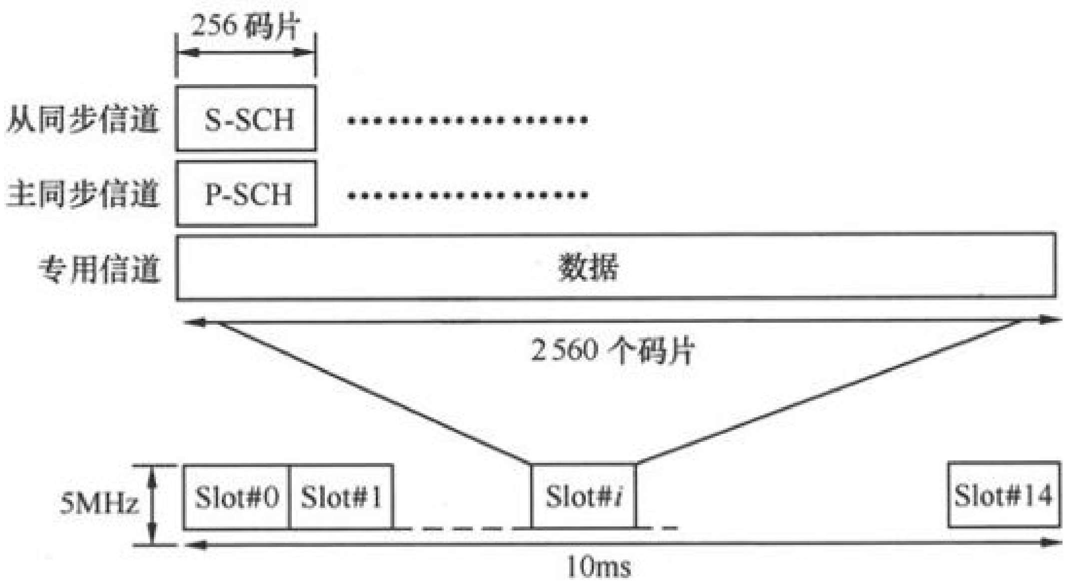
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班级二	神话	菊花台	笑忘书	枉凝眉	枉凝眉	枉凝眉
班级三	传奇	传奇	枉凝眉	马赛曲	笑忘书	菊花台
班级四	笑忘书	笑忘书	枉凝眉	笑忘书	马赛曲	笑忘书
班级五	枉凝眉	马赛曲	笑忘书	传奇	东风破	传奇
班级六	笑忘书	传奇	菊花台	马赛曲	东风破	神话

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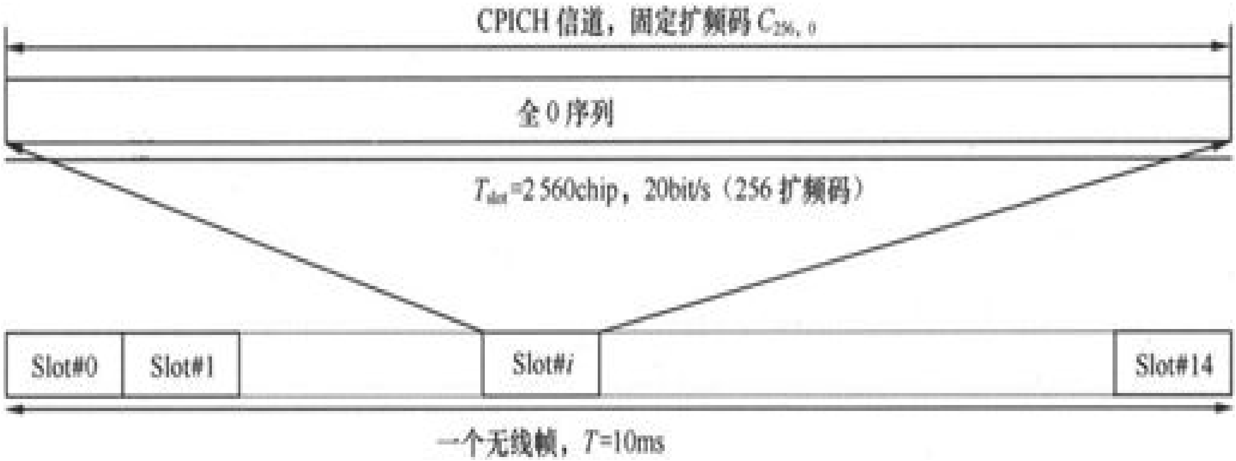
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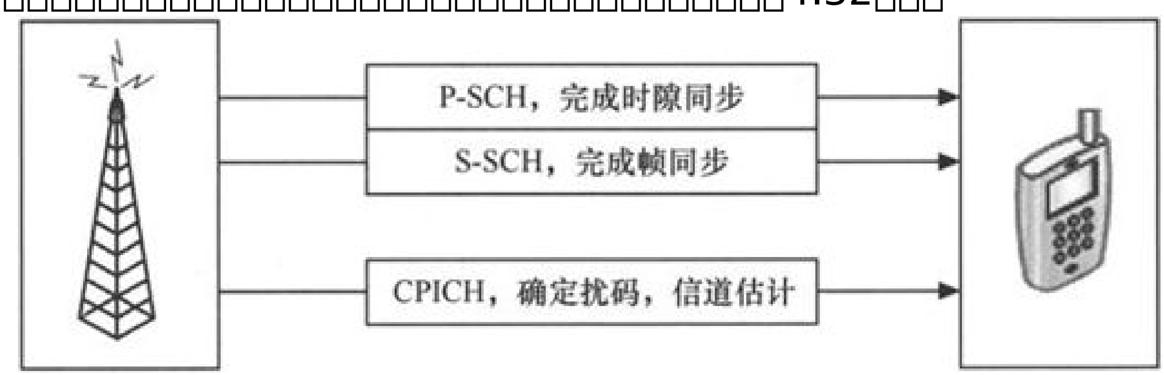
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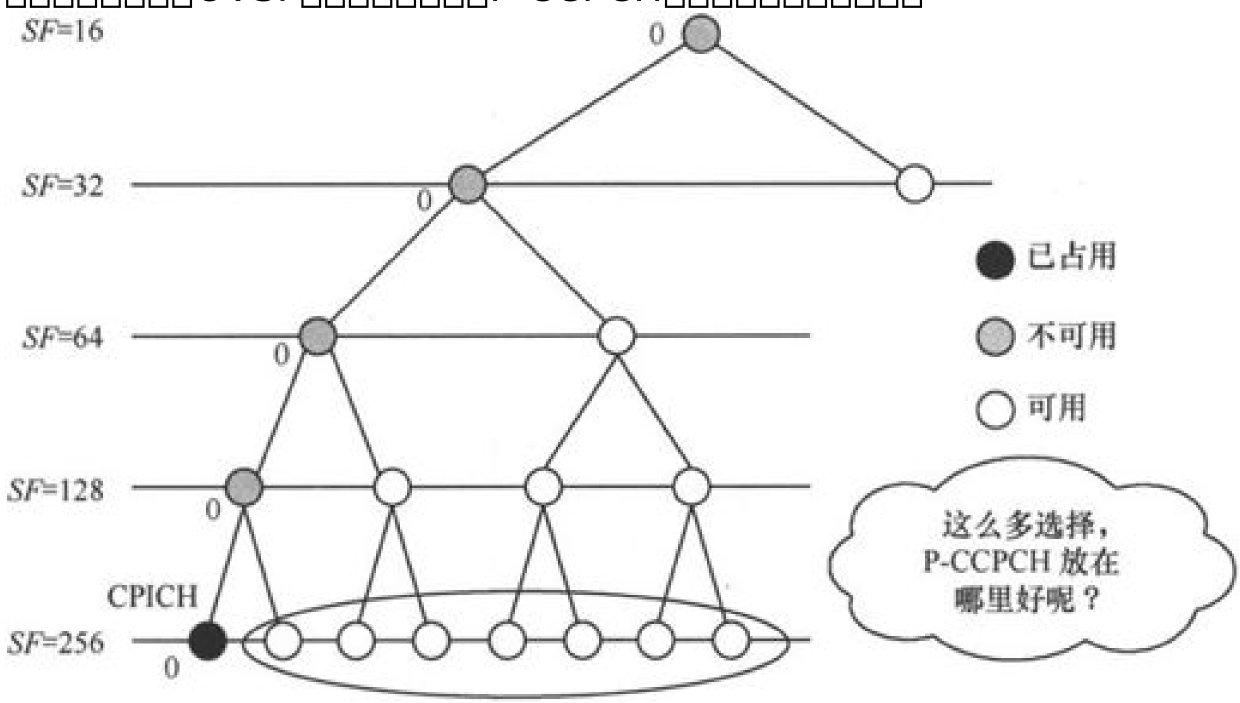


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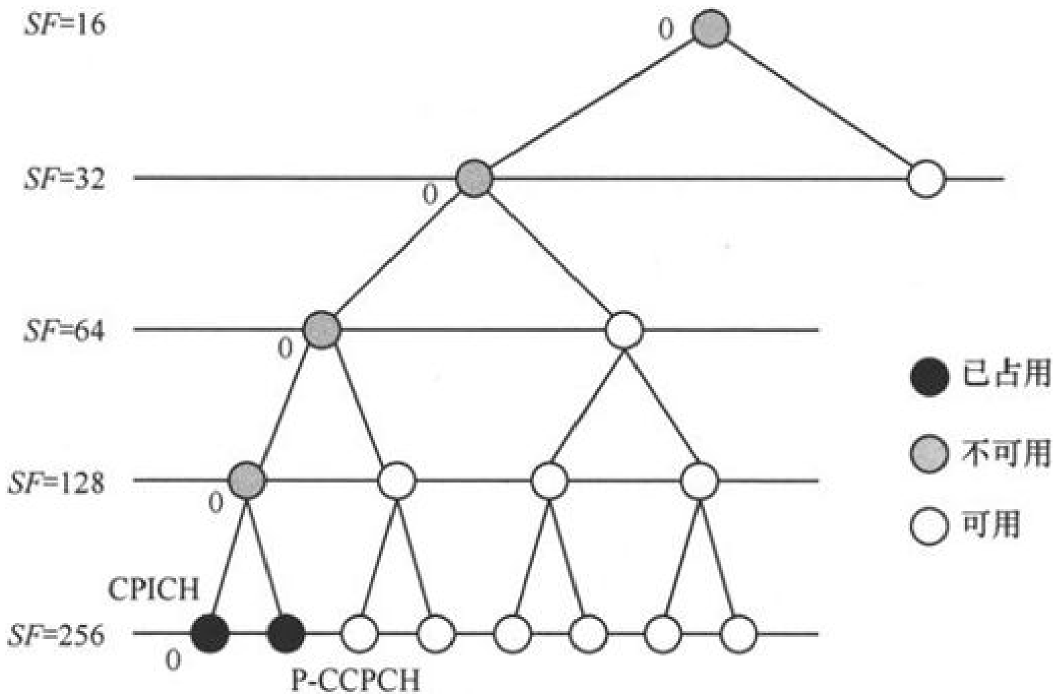
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4.34 P-CCPCH

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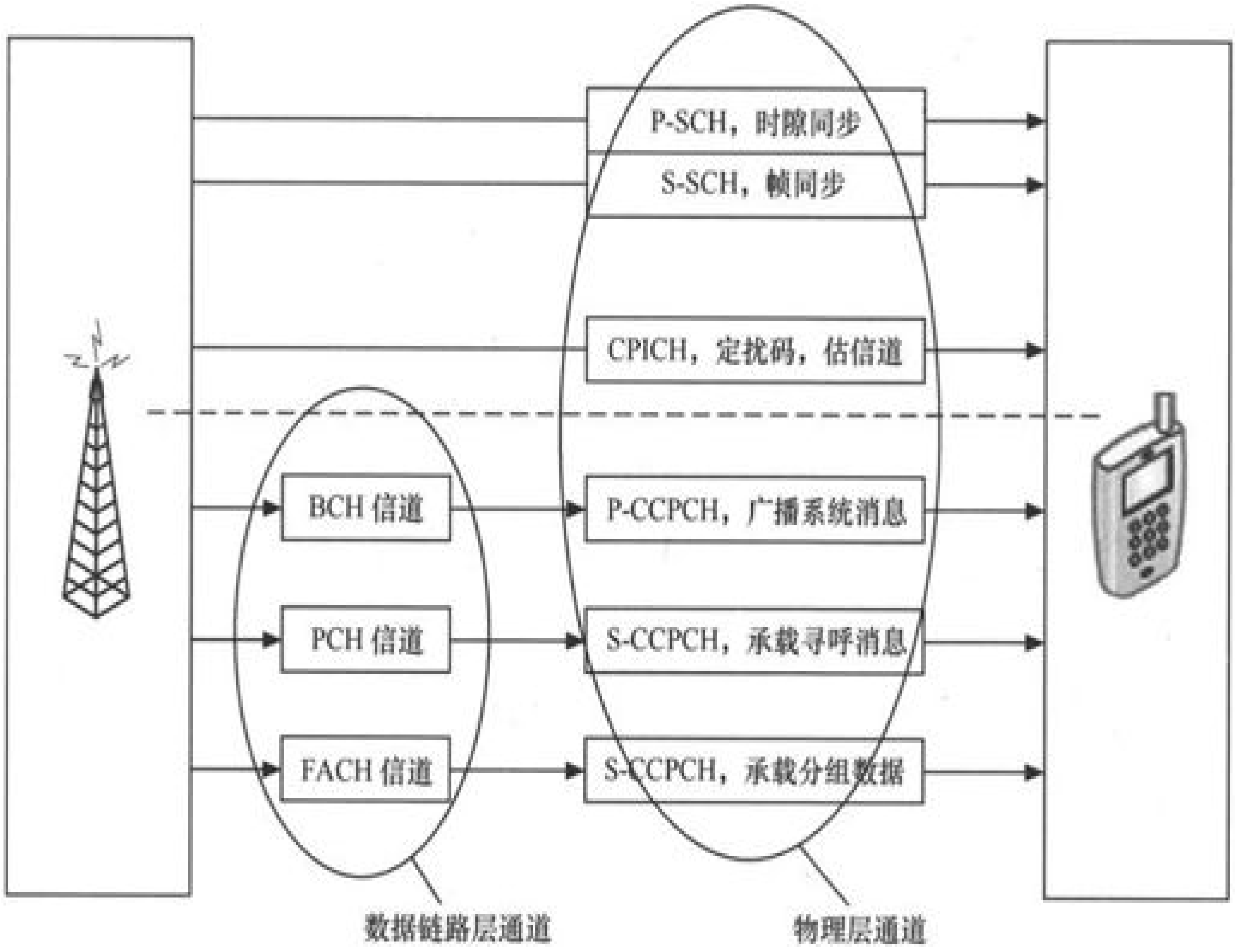
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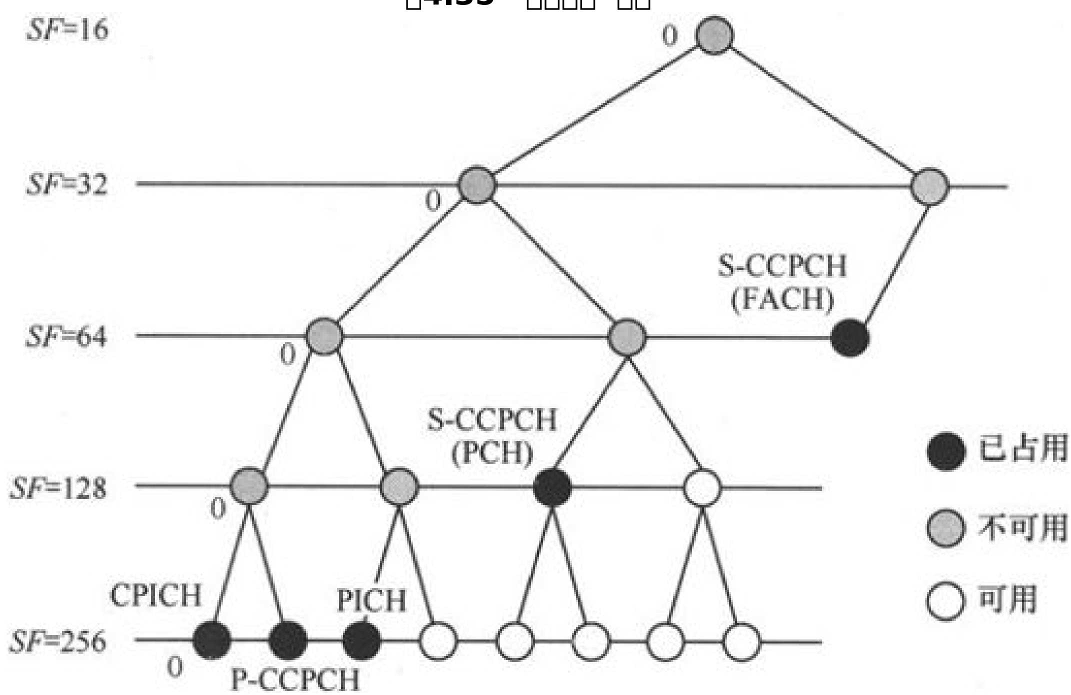
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S-SCH，帧同步
CPICH，定扰码，估信道
BCH 信道
PCH 信道
FACH 信道
P-CCPCH，广播系统消息
S-CCPCH，承载寻呼消息
S-CCPCH，承载分组数据
数据链路层通道
物理层通道

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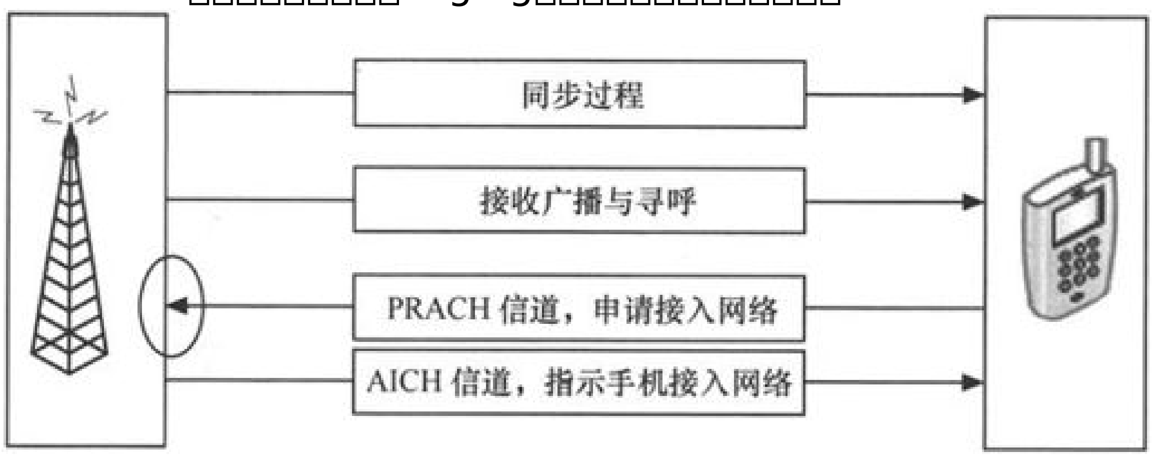

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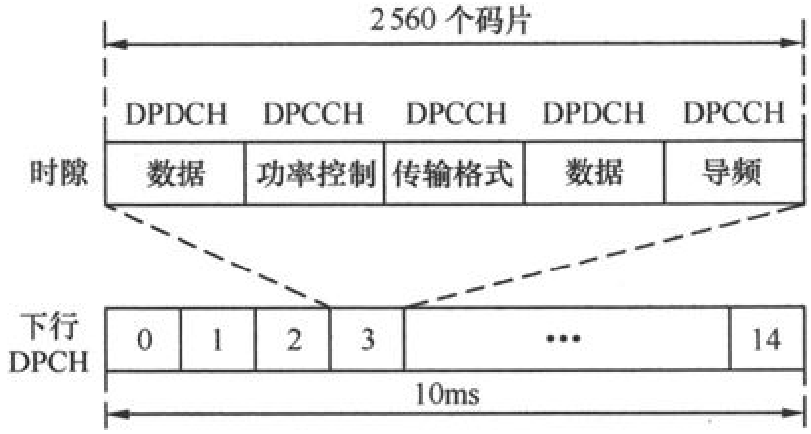
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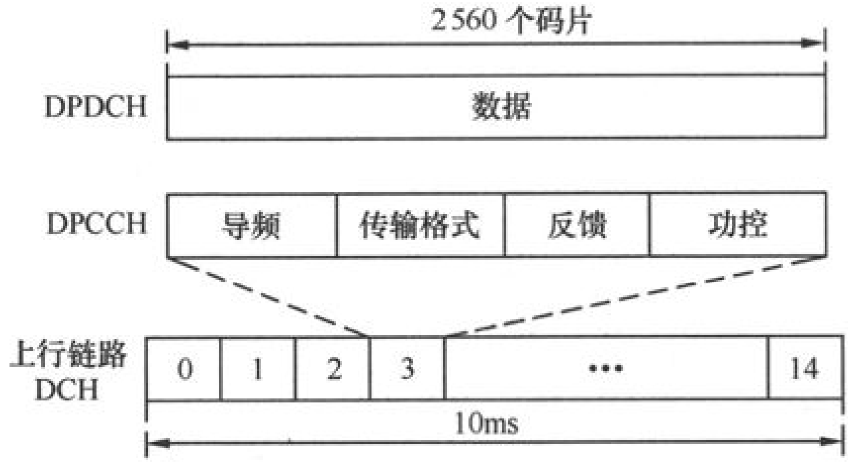
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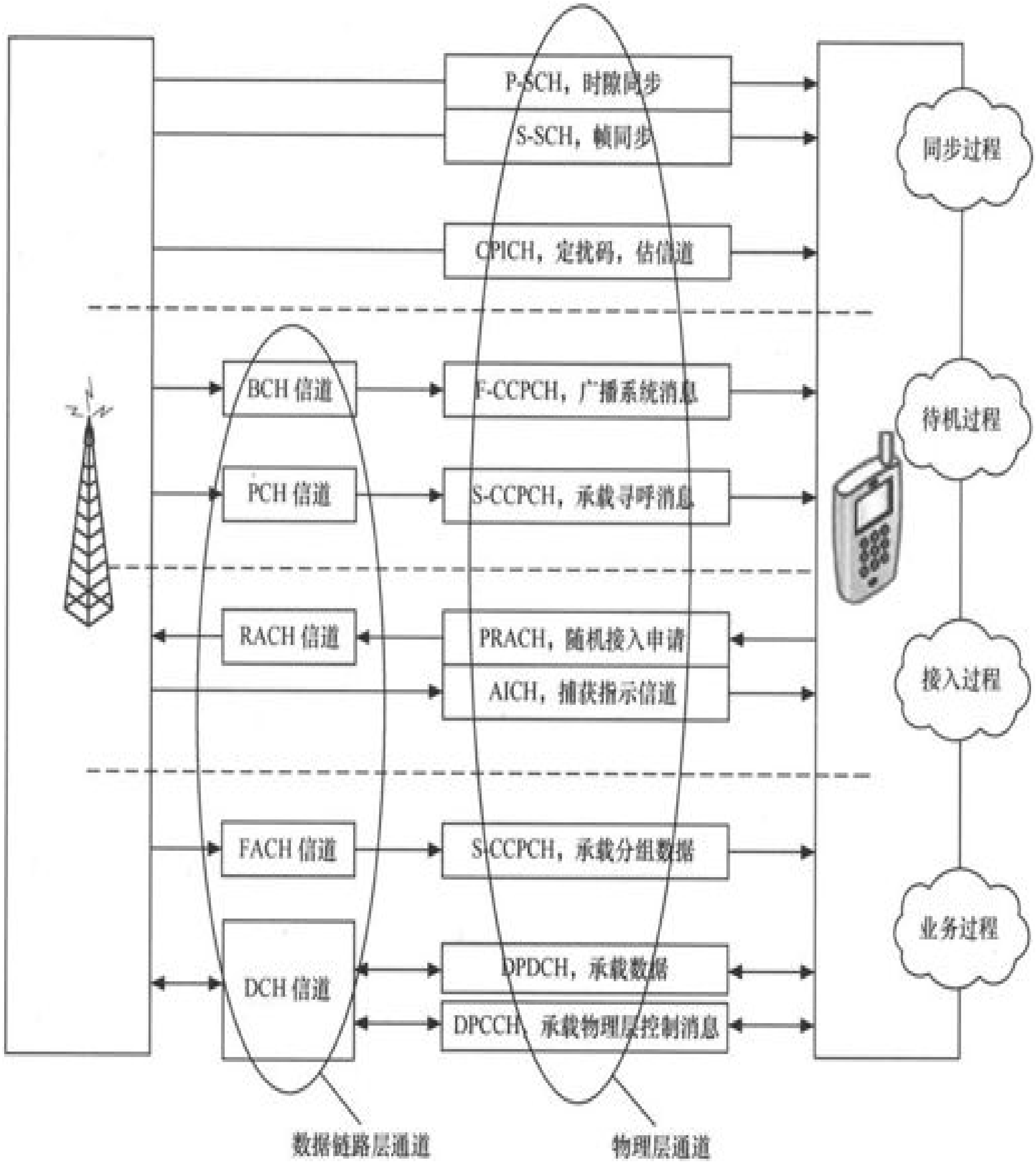
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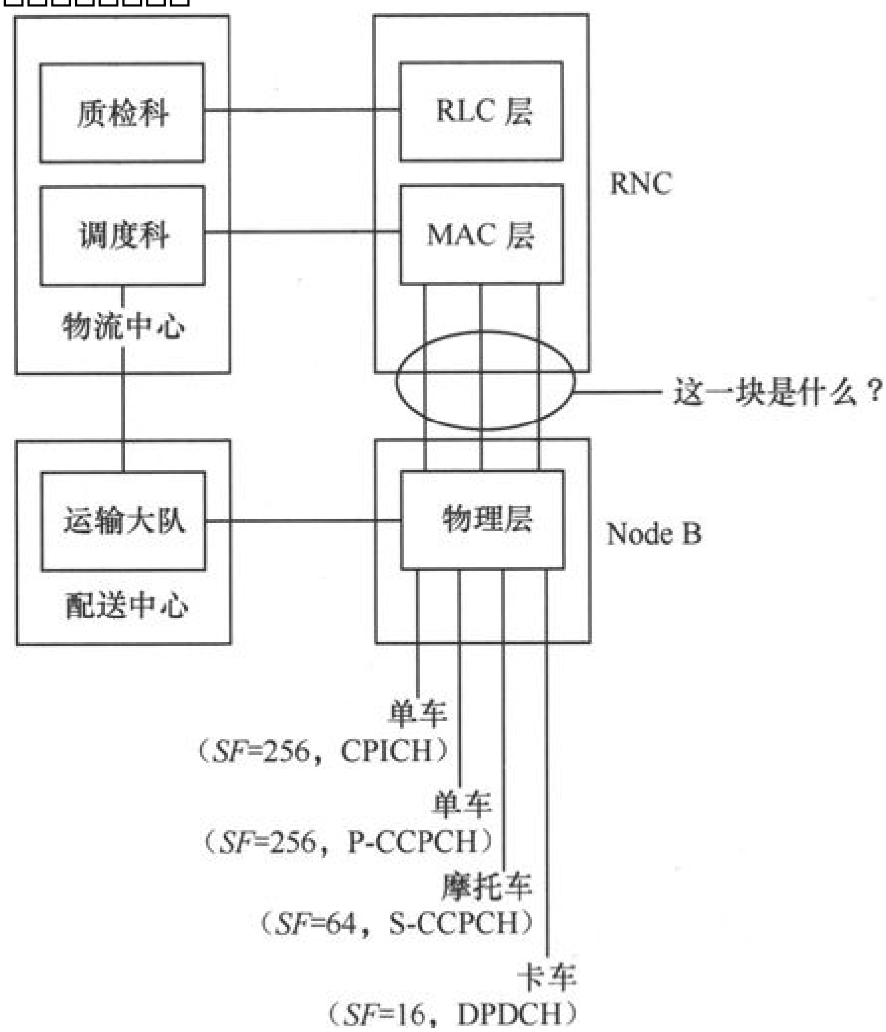
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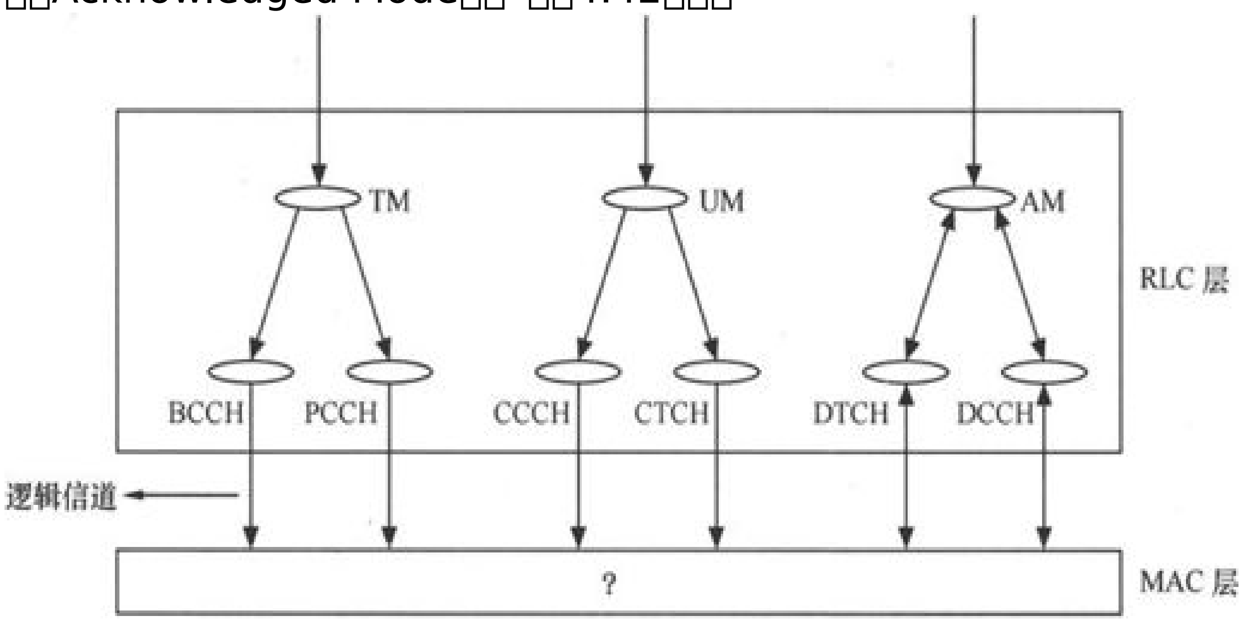
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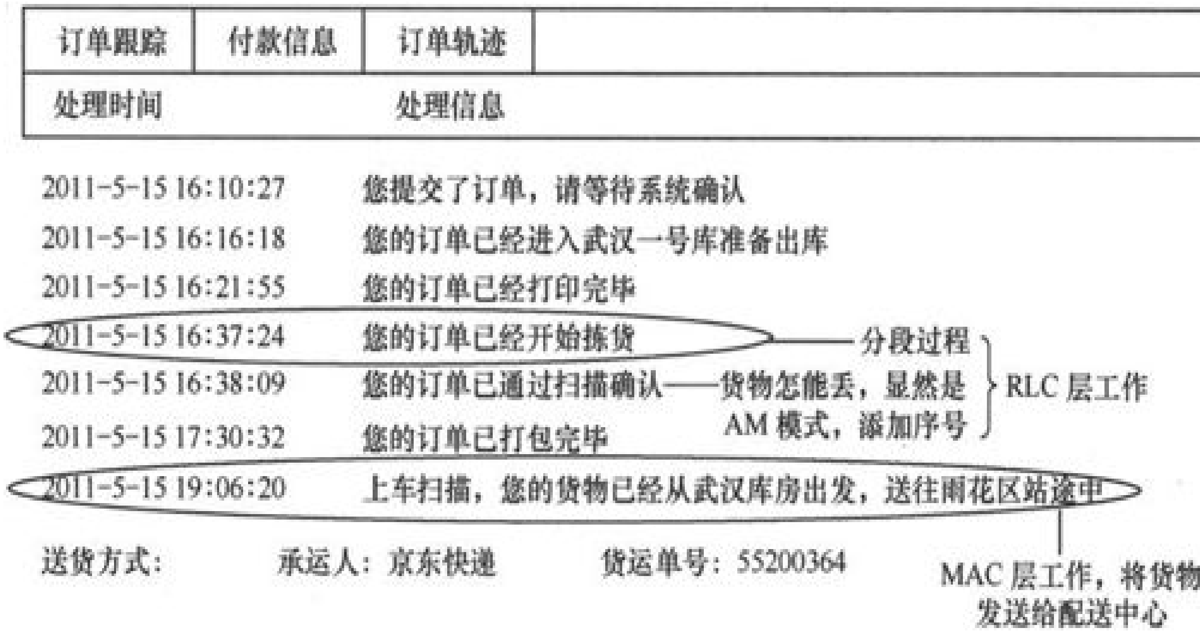


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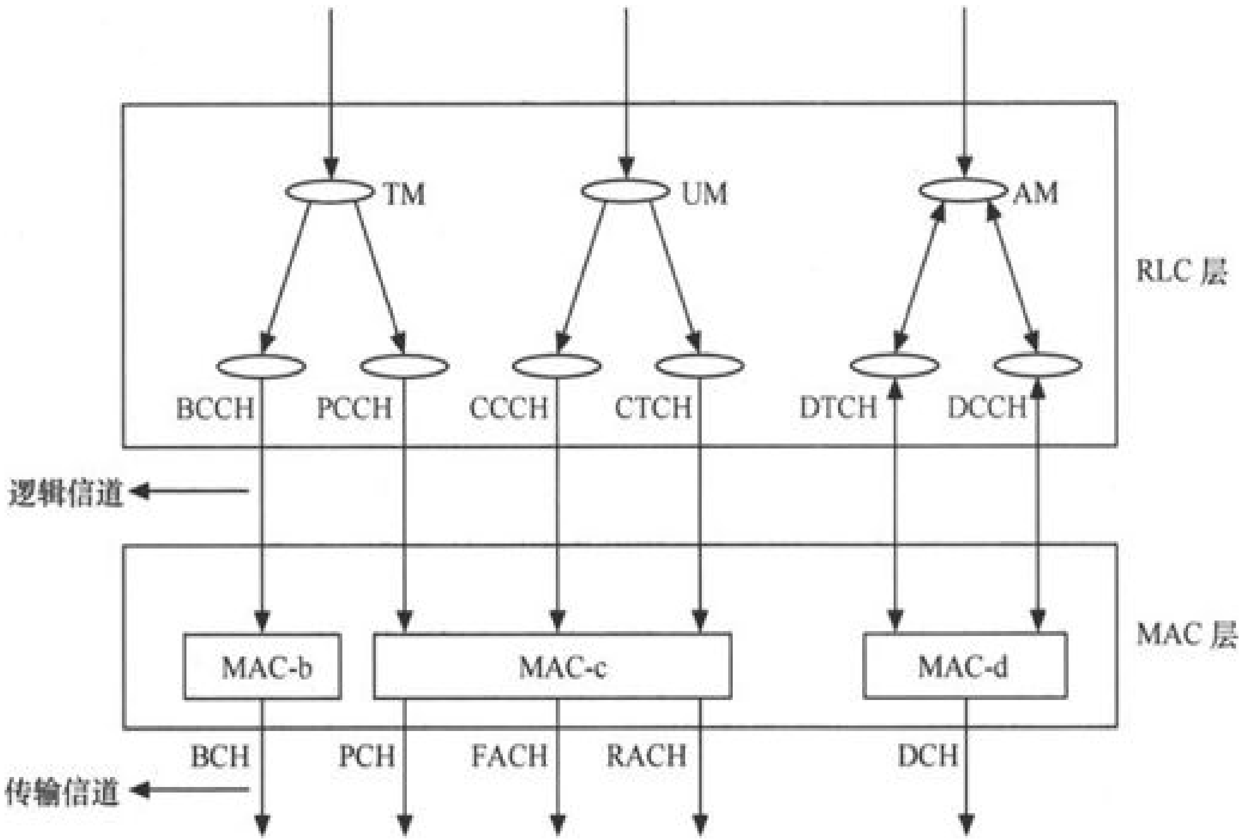
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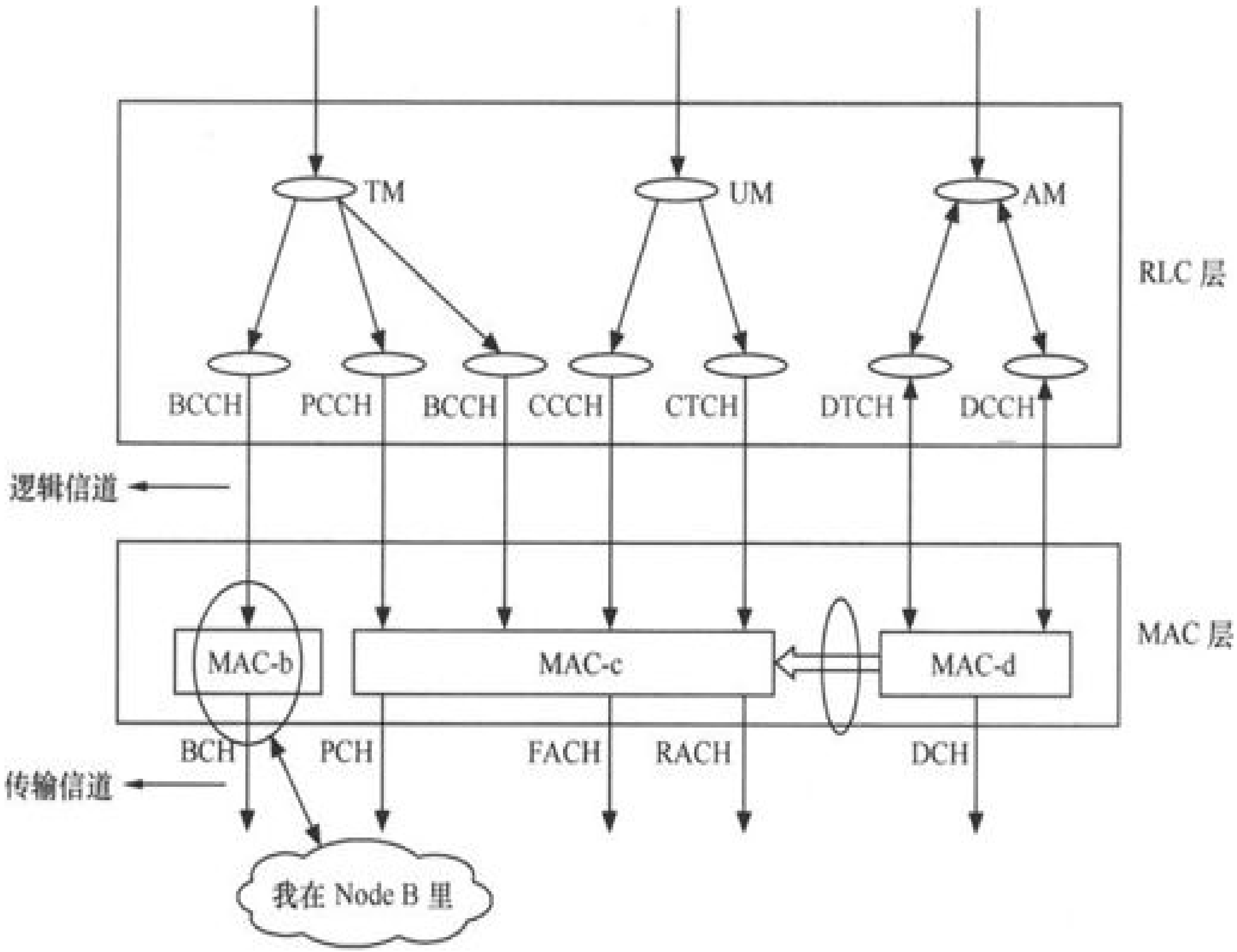
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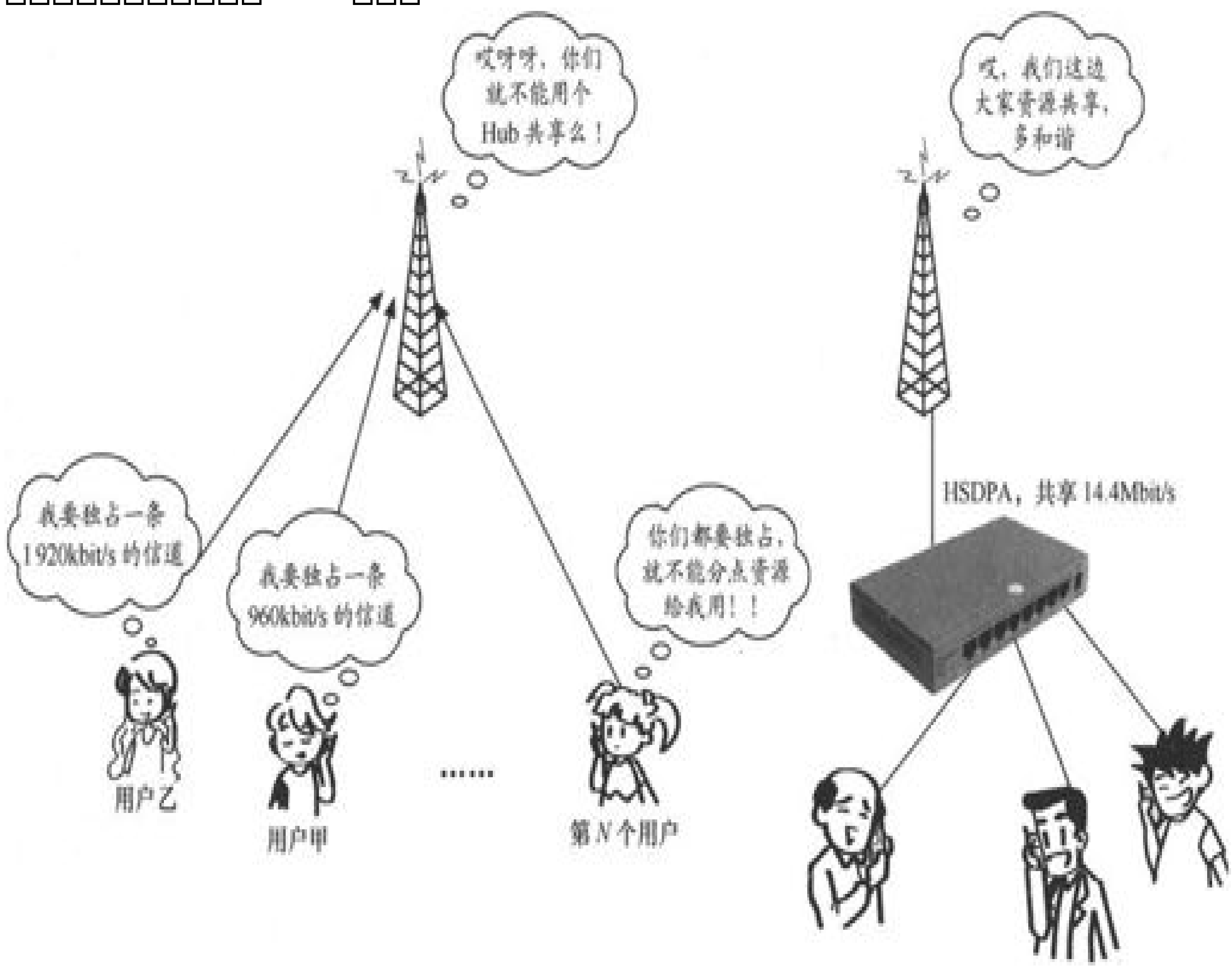
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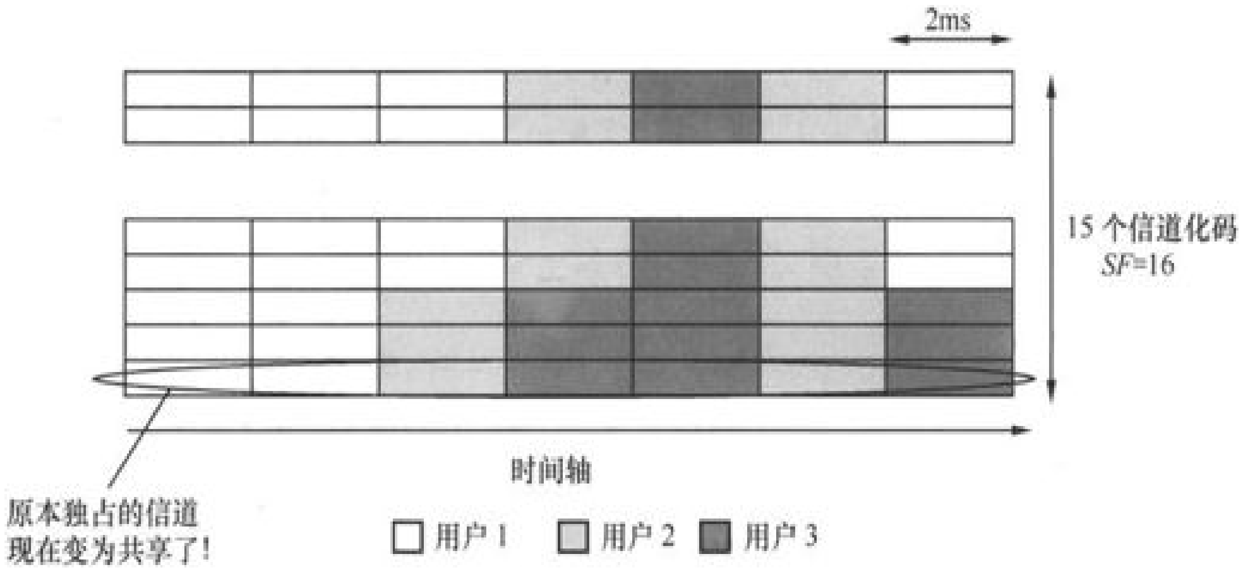


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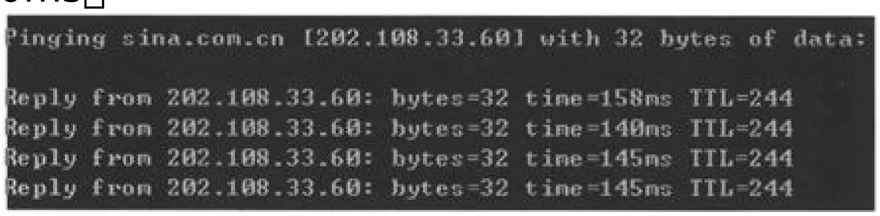
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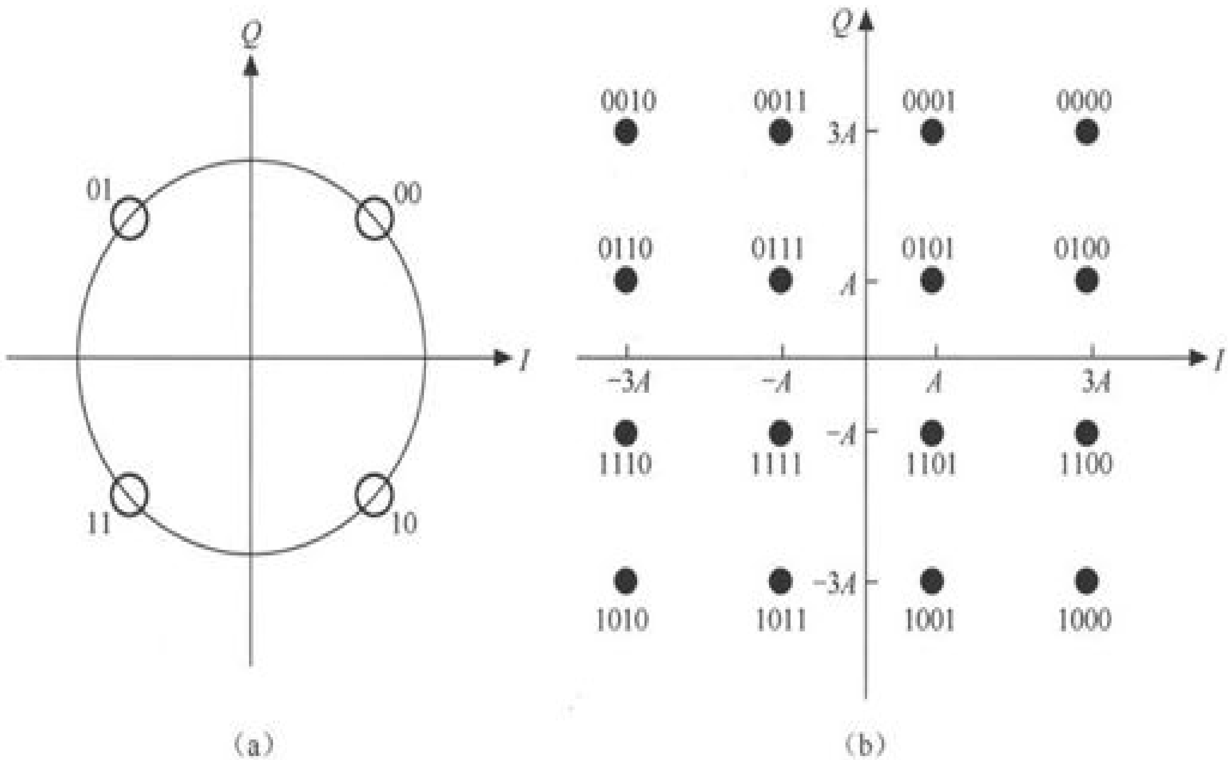
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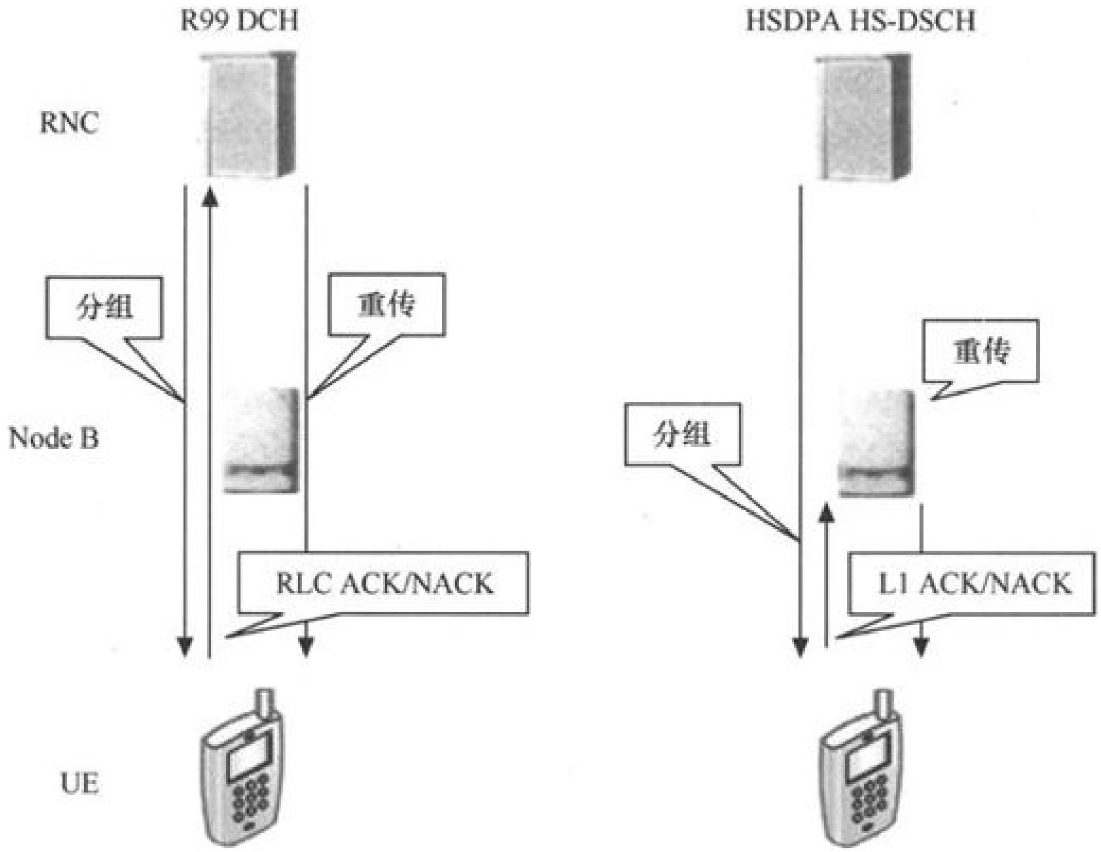
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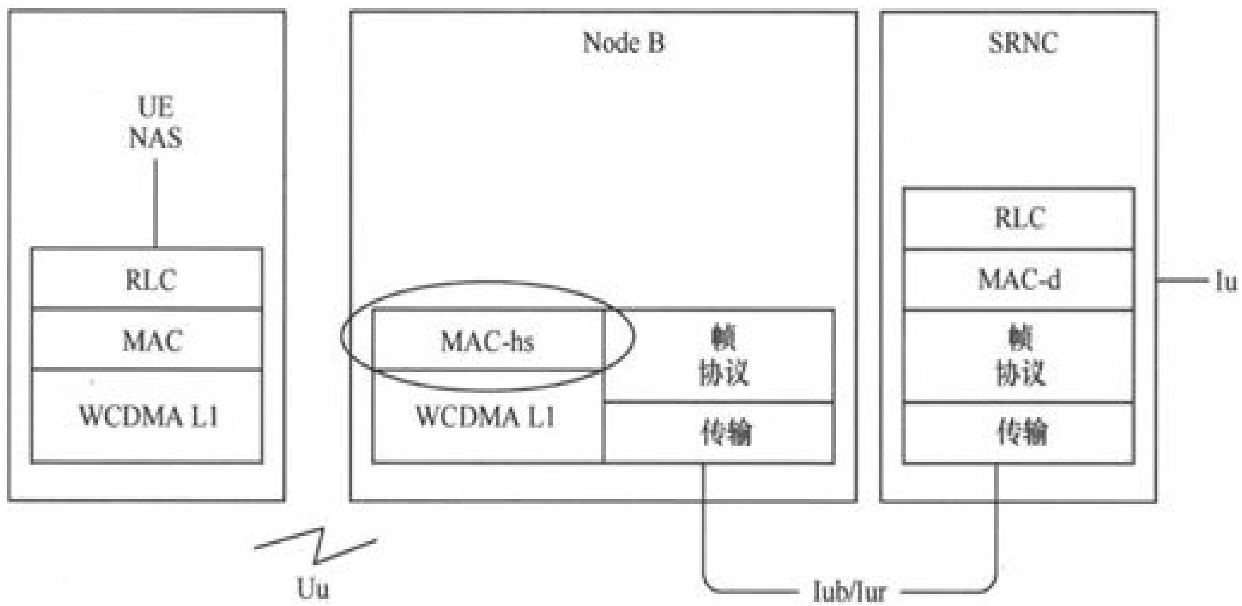
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[illegible]4.50 R99[illegible]HSDPA[illegible]

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□4.51 MAC-hs□□

4.5.2 “Web2.0□□”——HSUPA

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□□R99□□□DPDCH□□□□□

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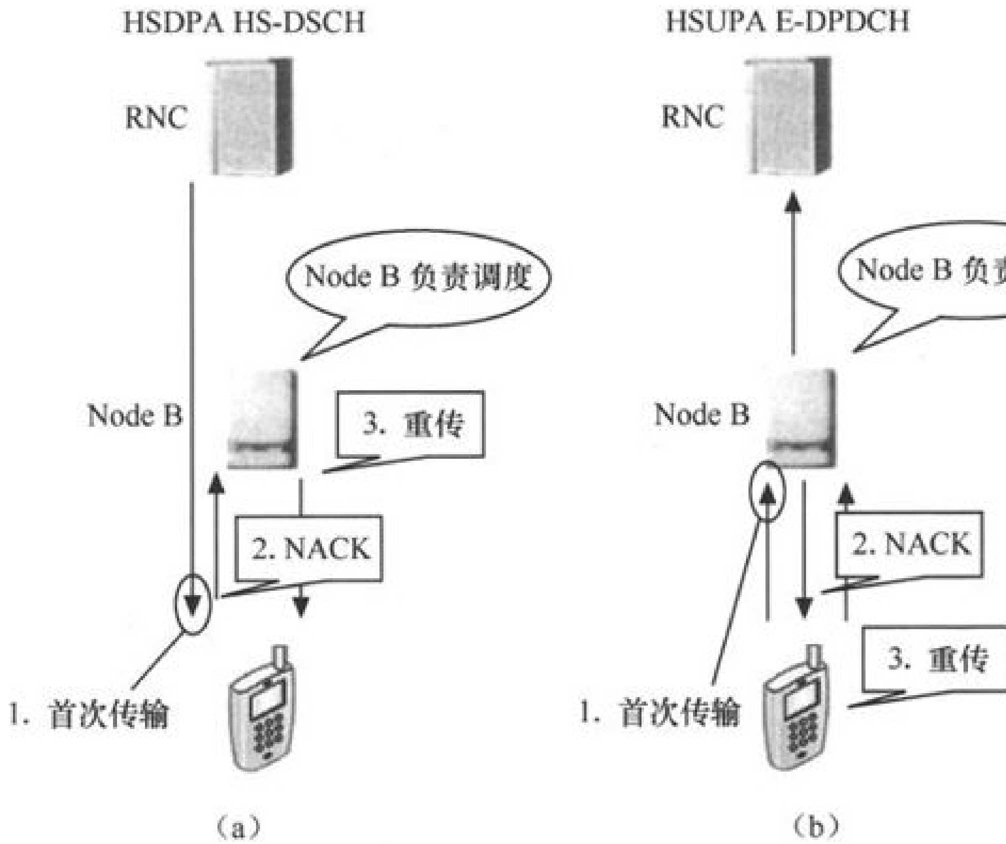
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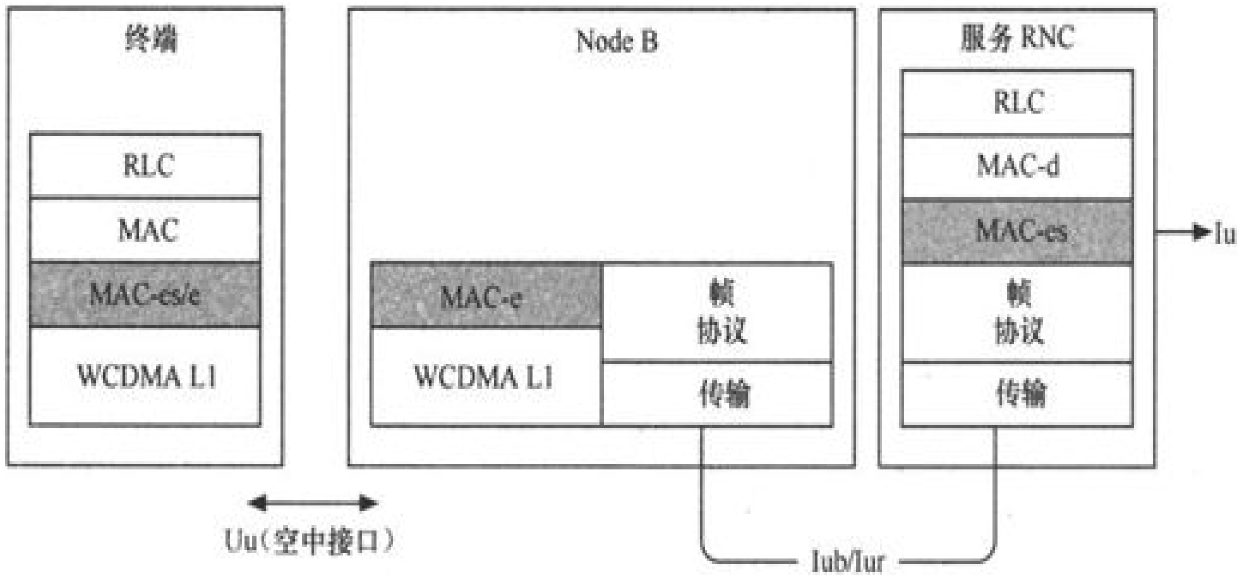


□4.52 HSUPA□HSDPA□□□□□□□□□

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□HSDPA□□□□□□□□□□□□□ARQ□□□□Node B□□□□□□MAC-hs□□□□□HSUPA□□□□□□□□□□□□□Node B□□□□□□MAC-e□□□□□□□□□□□□□□□□□Node B□□□RNC□□□□□□□□□□□□□□□□□□□□RNC□□□□□□□□□□□□□□□□□□□□□□□□□MAC-es□□□4.53□□□



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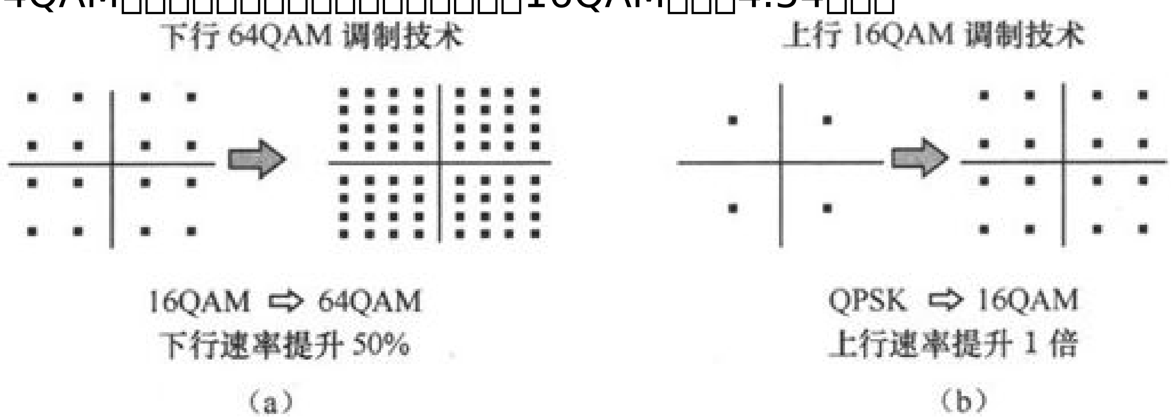
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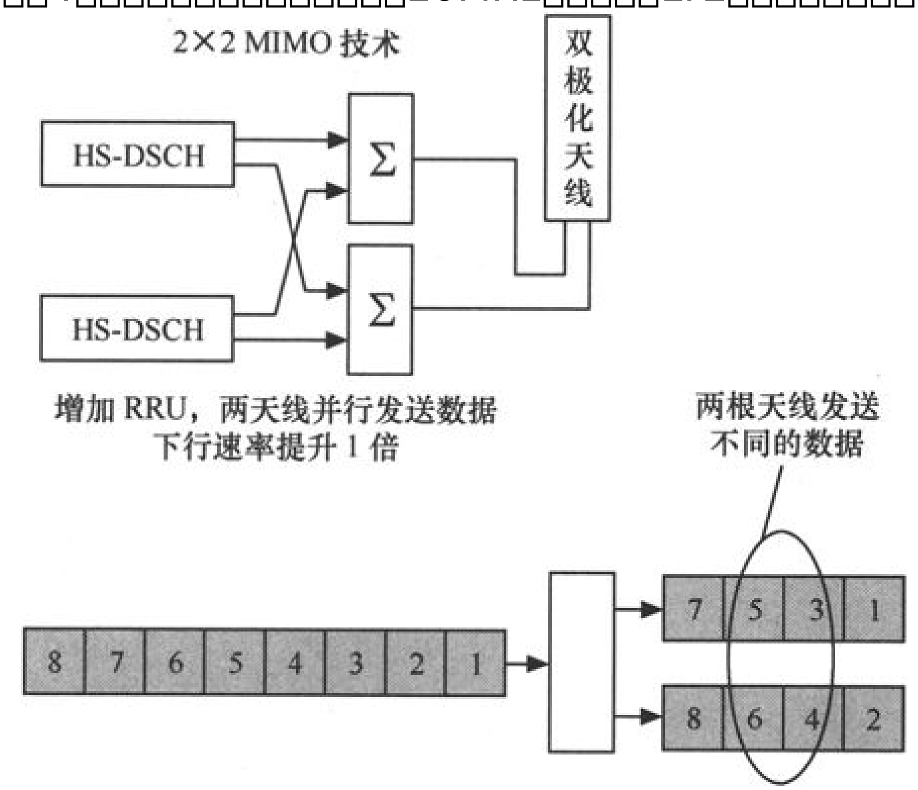
2□MIMO

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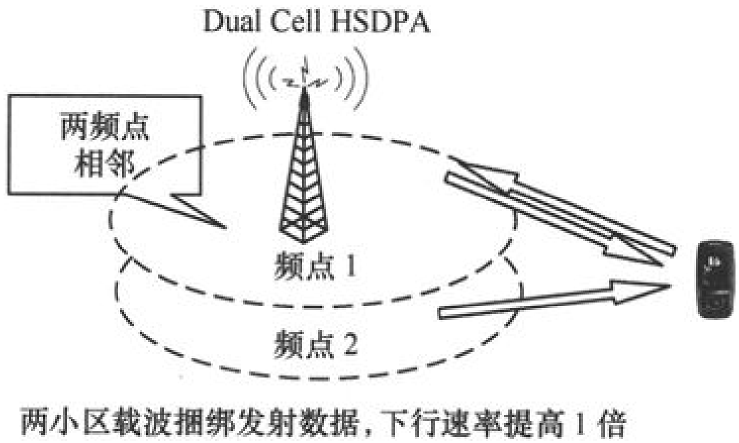
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□4.55 MIMO□□



□4.56 □□□□□

□□□□□□5□□□□□□□WCDMA□5MHz□□□5□□□□□□□□□□□□□□□□□□□□□□□□□□□

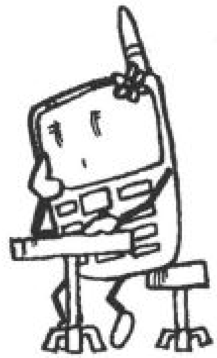
□□□HSPA+□□□□□□□□□□□□□HSPA+□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

□1□□□□□21Mbit/s□□□□□64QAM□□□□□□□□□50□□14.4Mbit/s×1.5□21.6Mbit/s□

□2□□□□□28Mbit/s□□□□□MIMO□□□□□□□□□□□1□□14.4Mbit/s×2□28.8Mbit/s□

□3□□□□□43.2Mbit/s□□□□□64QAM□□□□□□□□□MIMO□□□□□□□□14.4Mbit/s×1.5×2□43.2Mbit/s□

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Chapter 5
TD-SCDMA[illegible]



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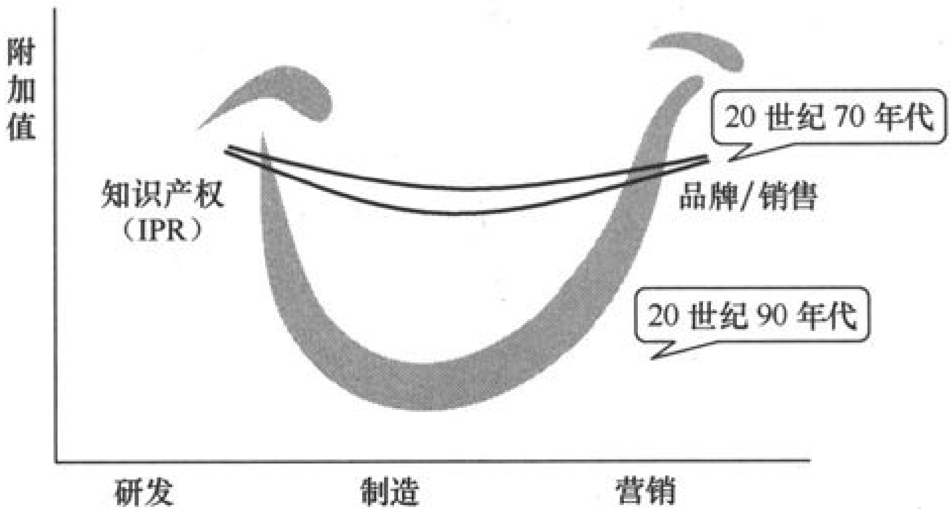
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5.1.2 [illegible]

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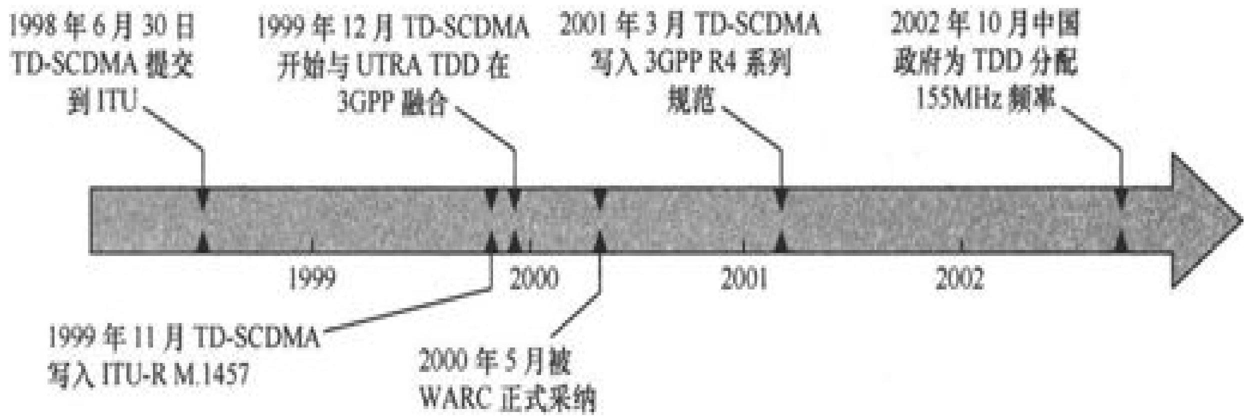
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5.1.3 TD-SCDMA[illegible]

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□5.2　TD-SCDMA□□□□□□□

CWTS□□□□□□□□□□□□□□□□□□□□□□□□□1999□5□□3GPP□□□□4□□□□□□□□3GPP PCG□□□□□□□TSG□□□□□□□□□□□□□□□□9□□□3GPP□□□TD-SCDMA□□3GPP□□□□□1999□12□□□□□□3GPP□□□□□□□3GPP TSG RAN□□□□□□□□□□□□□□□TD-SCDMA□□□Release 2000□□□□□R4□R5□□□□□□□□□□TD-SCDMA□□□LCR TDD□Low Code Rate TDD□□□□□□TDD□□□

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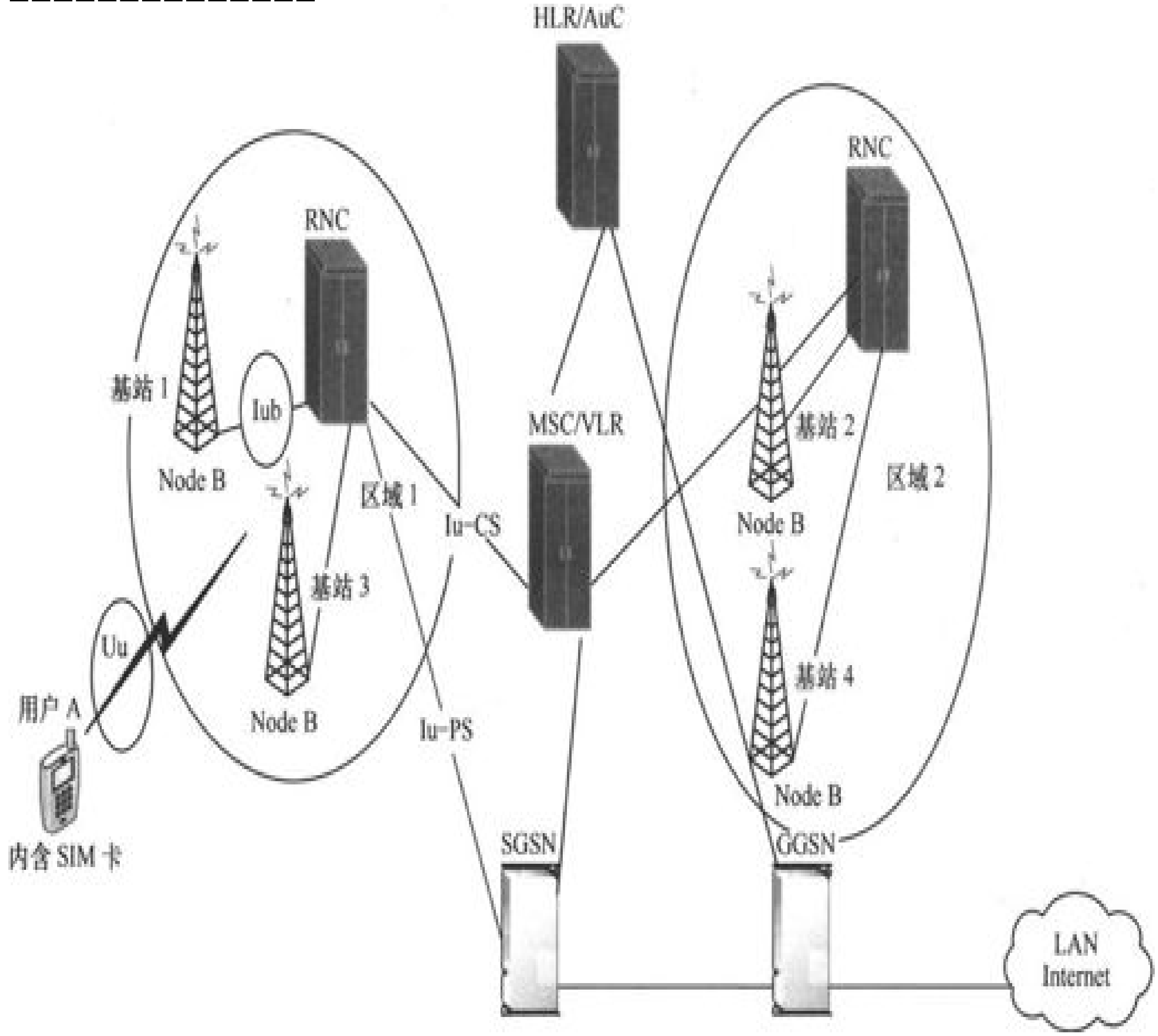
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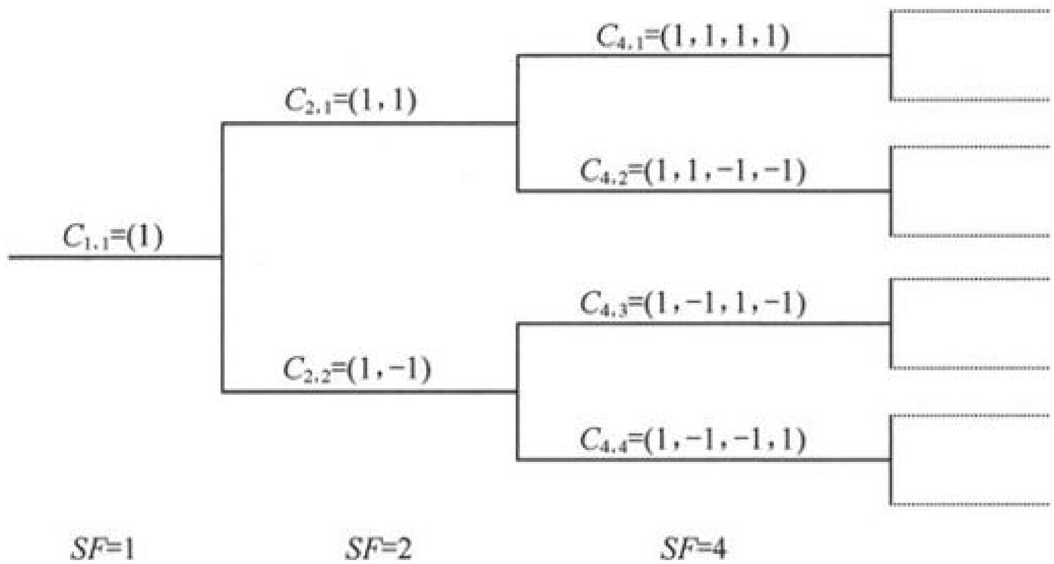
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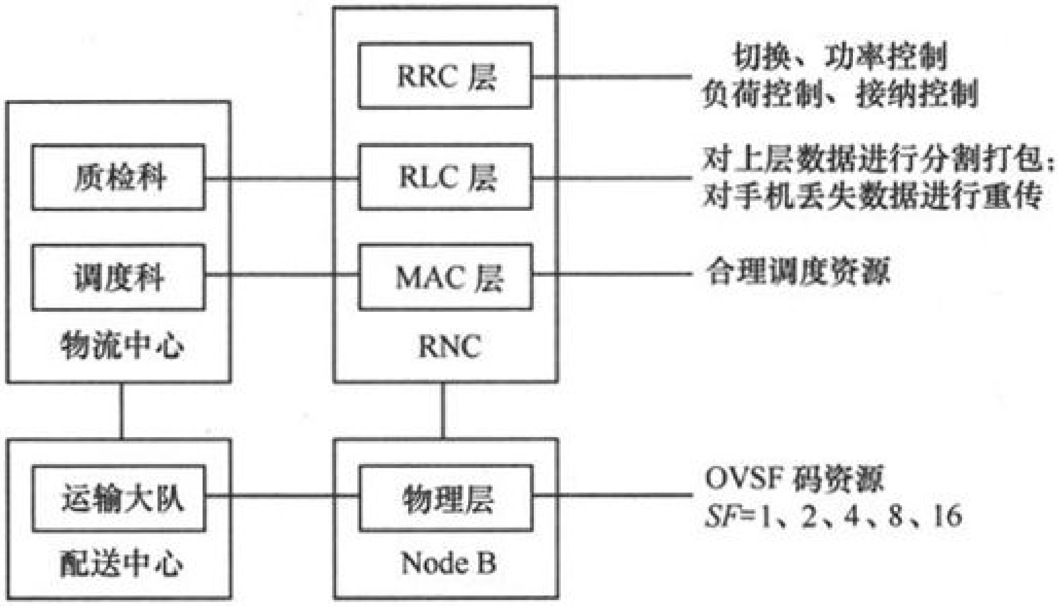
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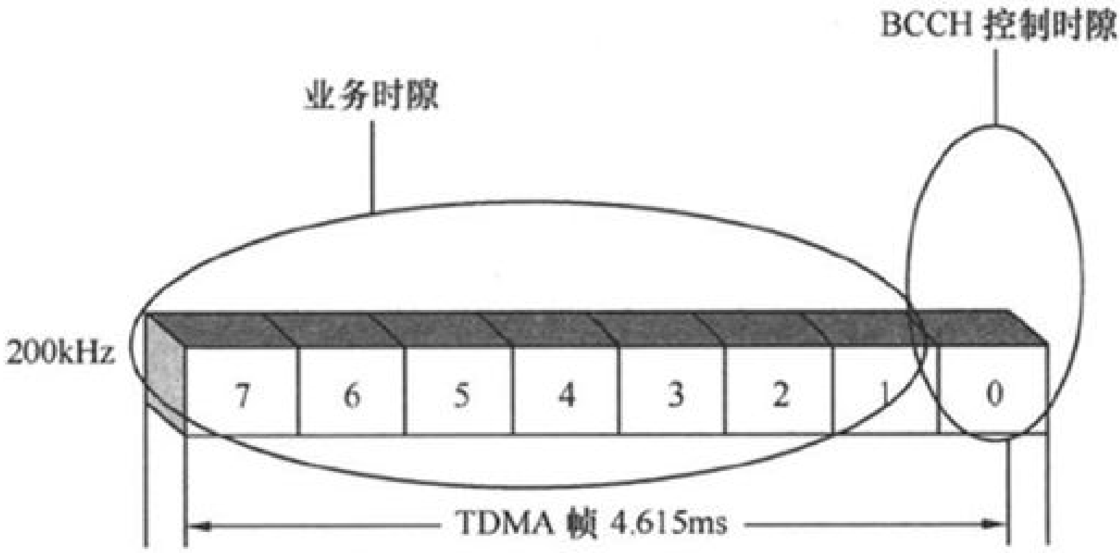
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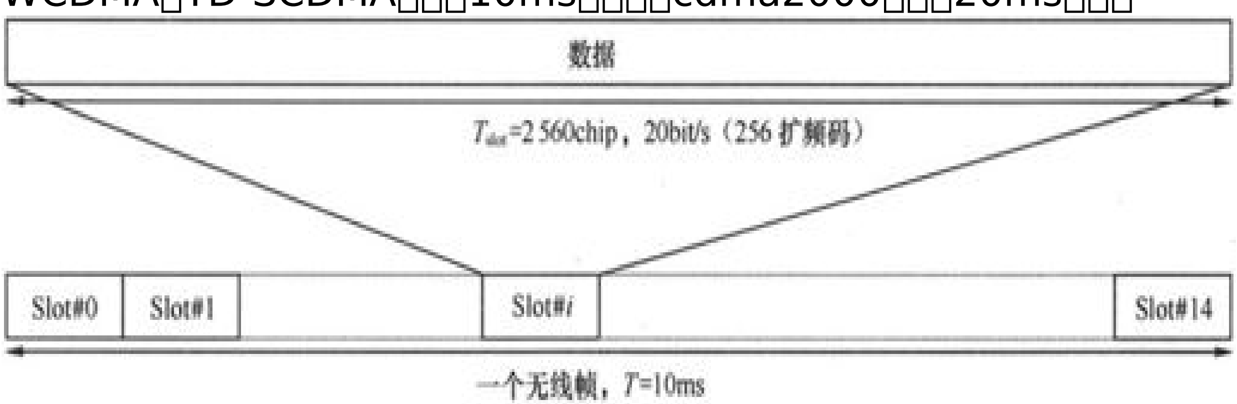
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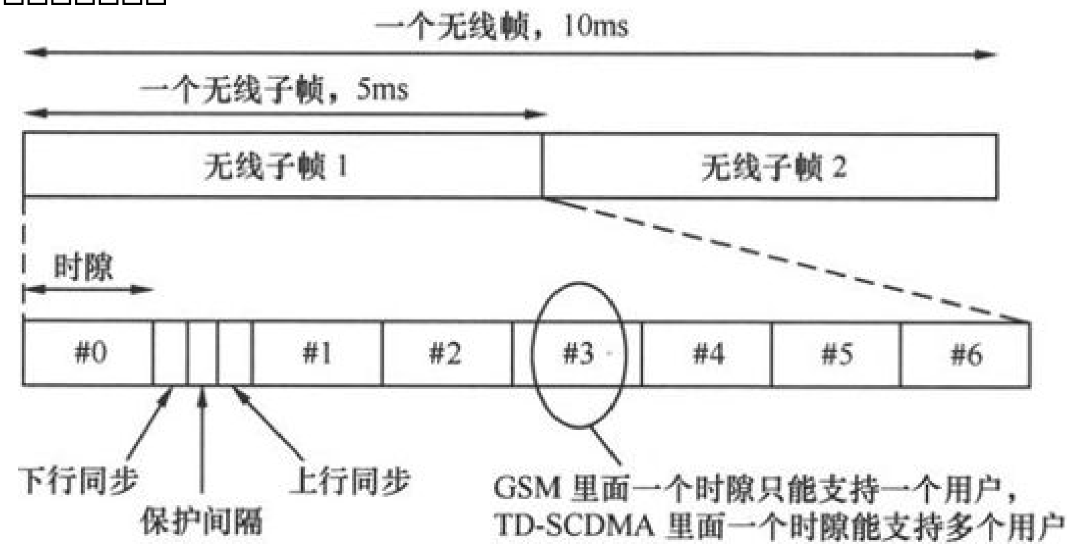
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□5.7 WCDMA□□□□

□5.8□TD-SCDMA□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
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□5.8 TD-SCDMA□□□

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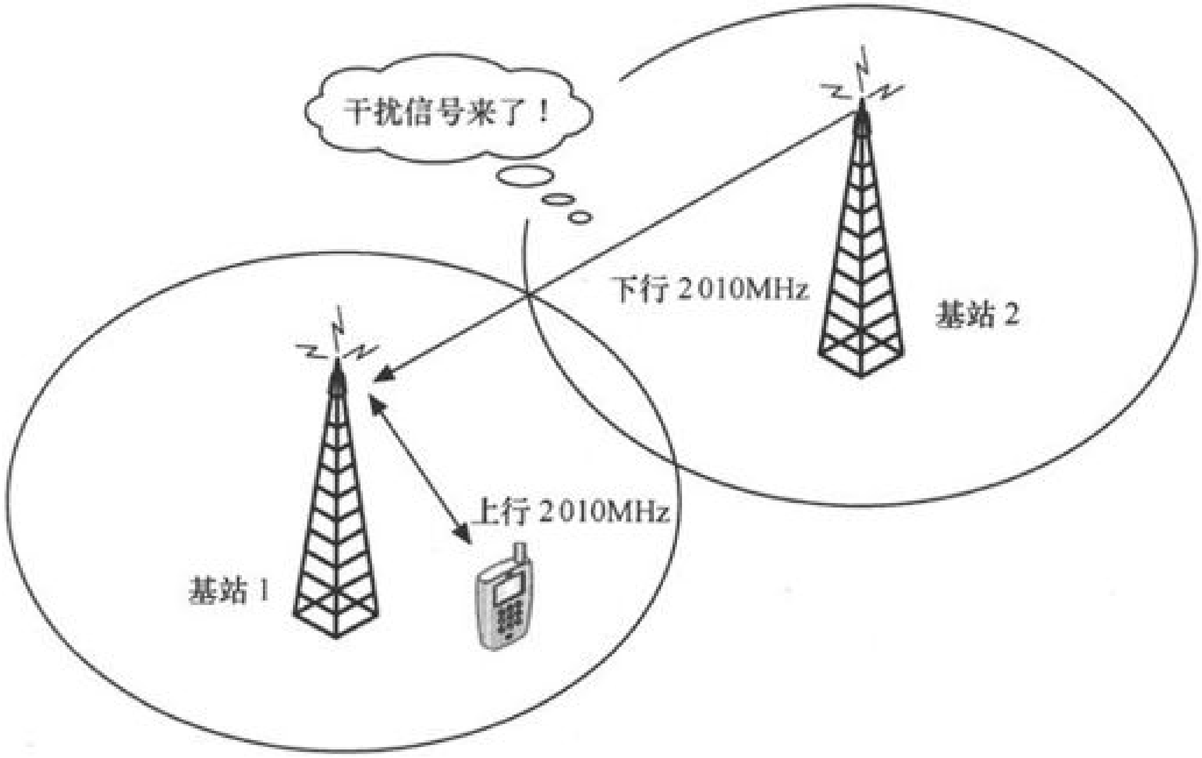
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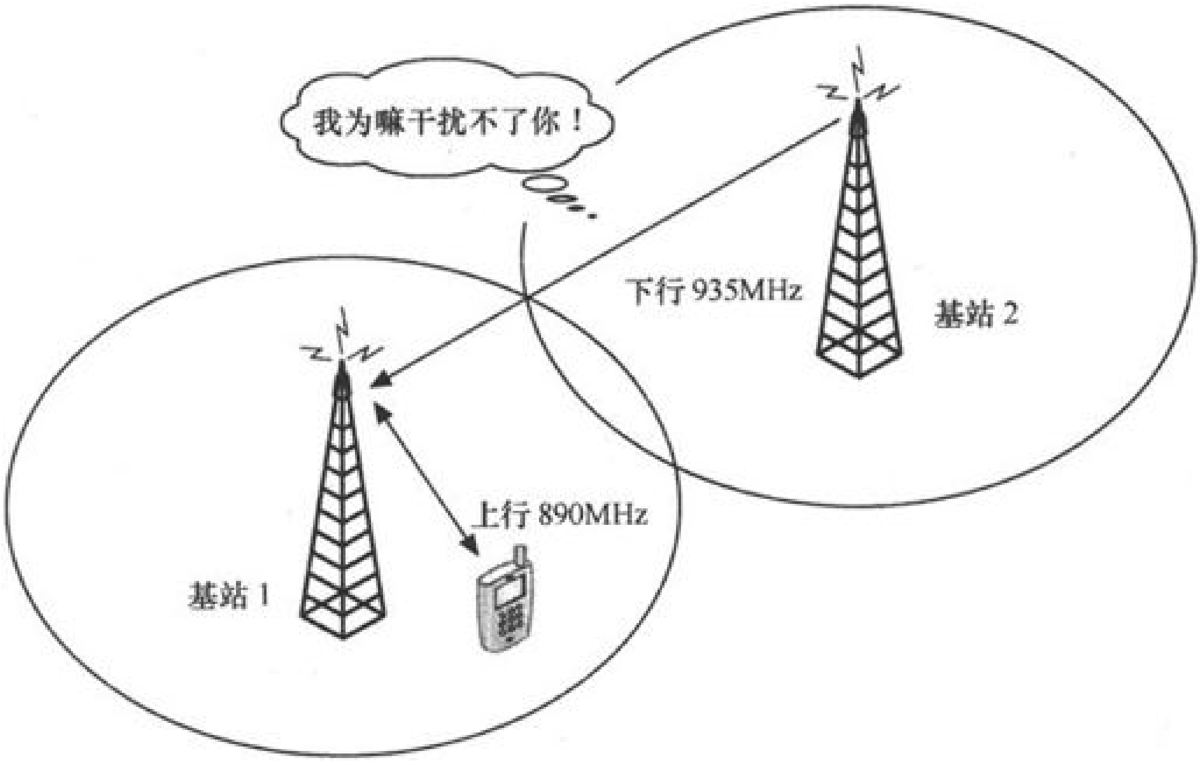
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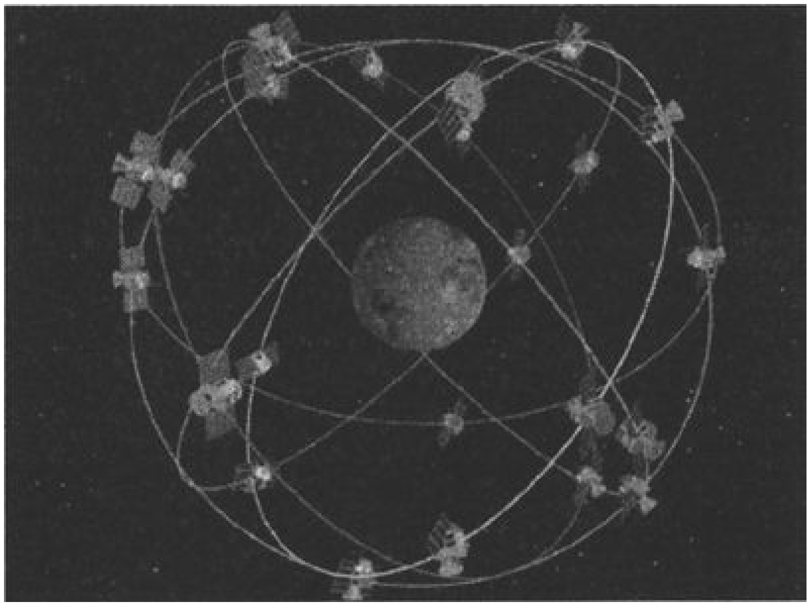
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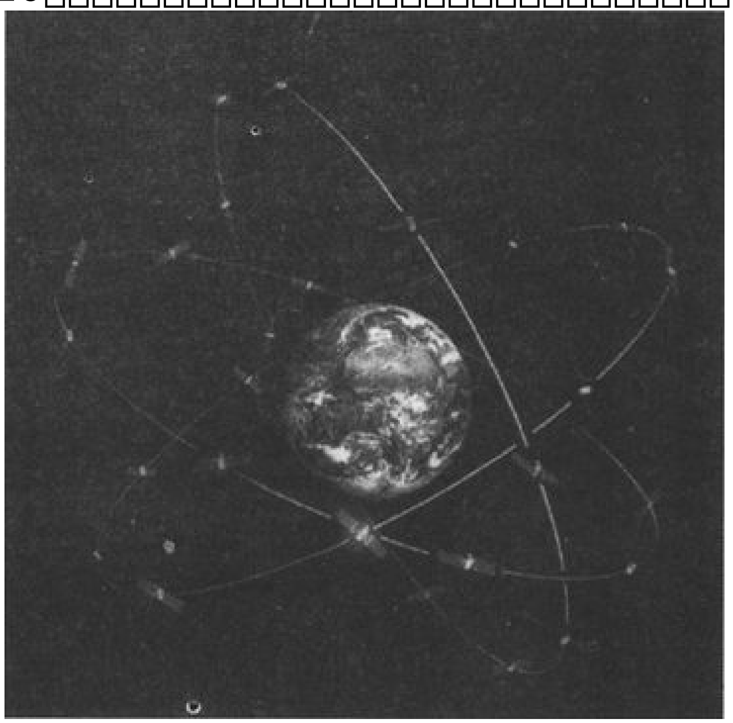
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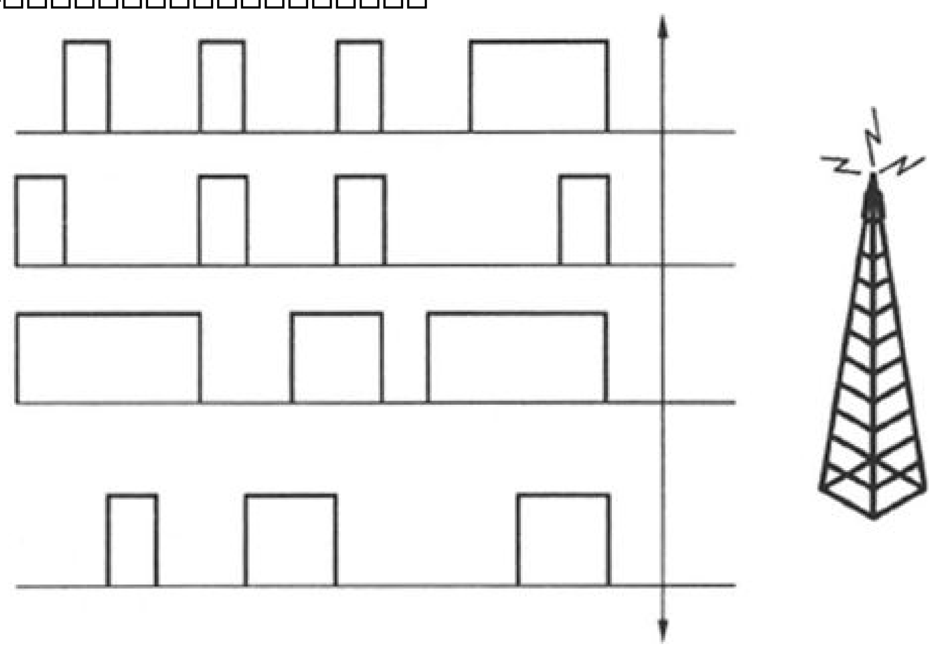
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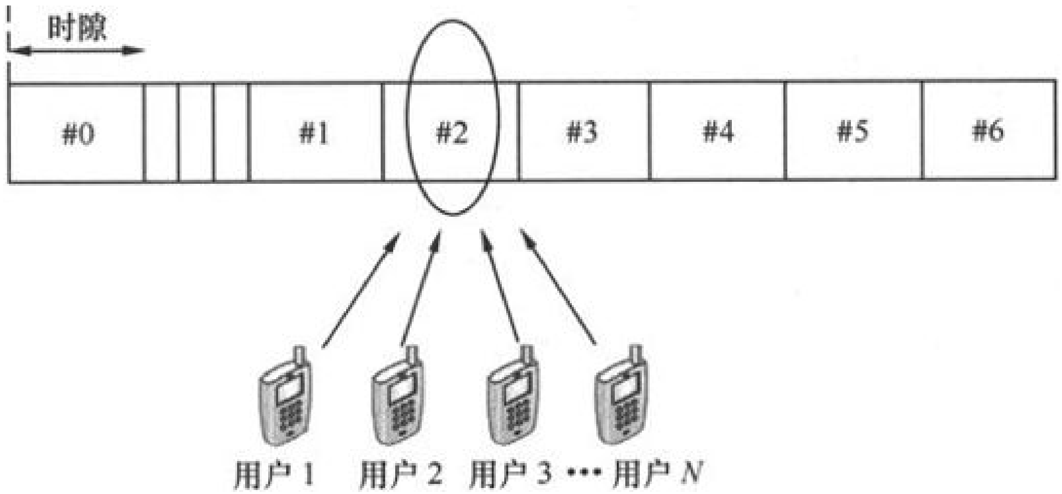
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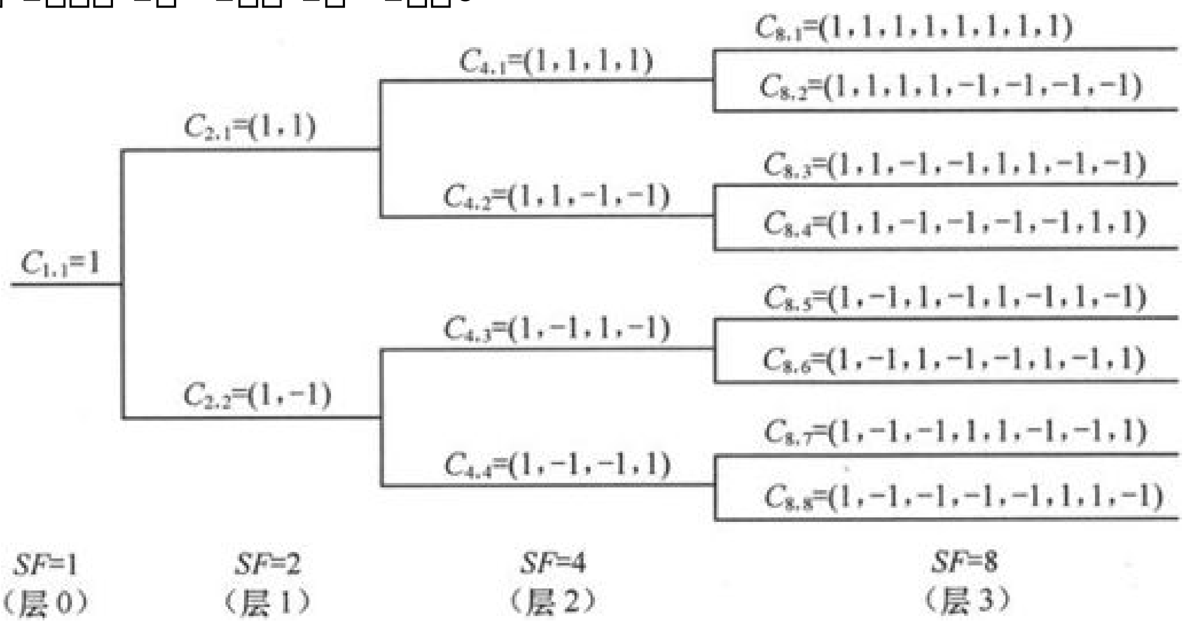
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　　$C_{8,2}$×$C_{8,4}$□□1×1□1×1□1×□-1□□1×□-1□□□-1□×□-1□□□-1□×□-1□□□-1□×1□□-1□×1□□0



□5.15　OVSF□□

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$C_{8,2}$×$C_{8,4}$□□□□□□1×1□1×1□1×1□1×□-1□□□-1□×□-1□□□-1□×□-1□□□-1□×□-1□□□-1□×1□□4

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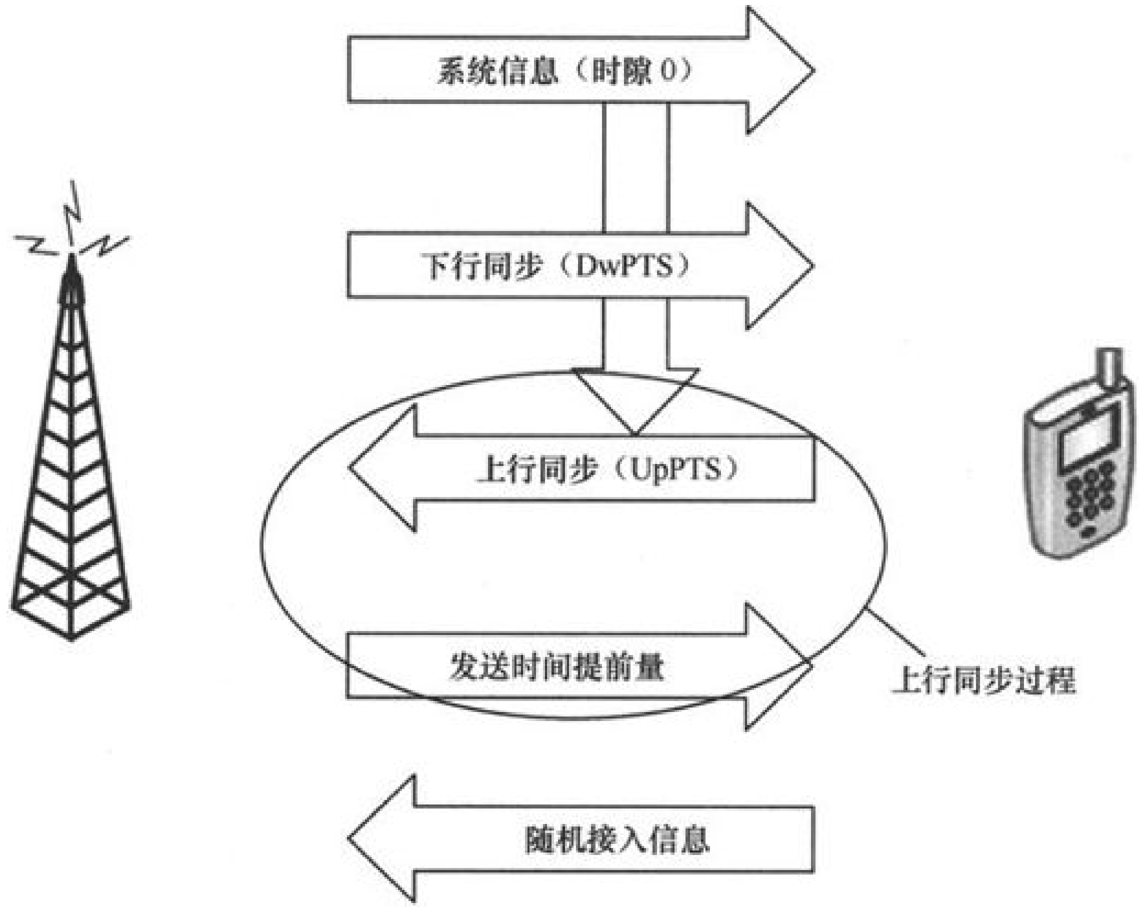
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2□□□□□□□□□

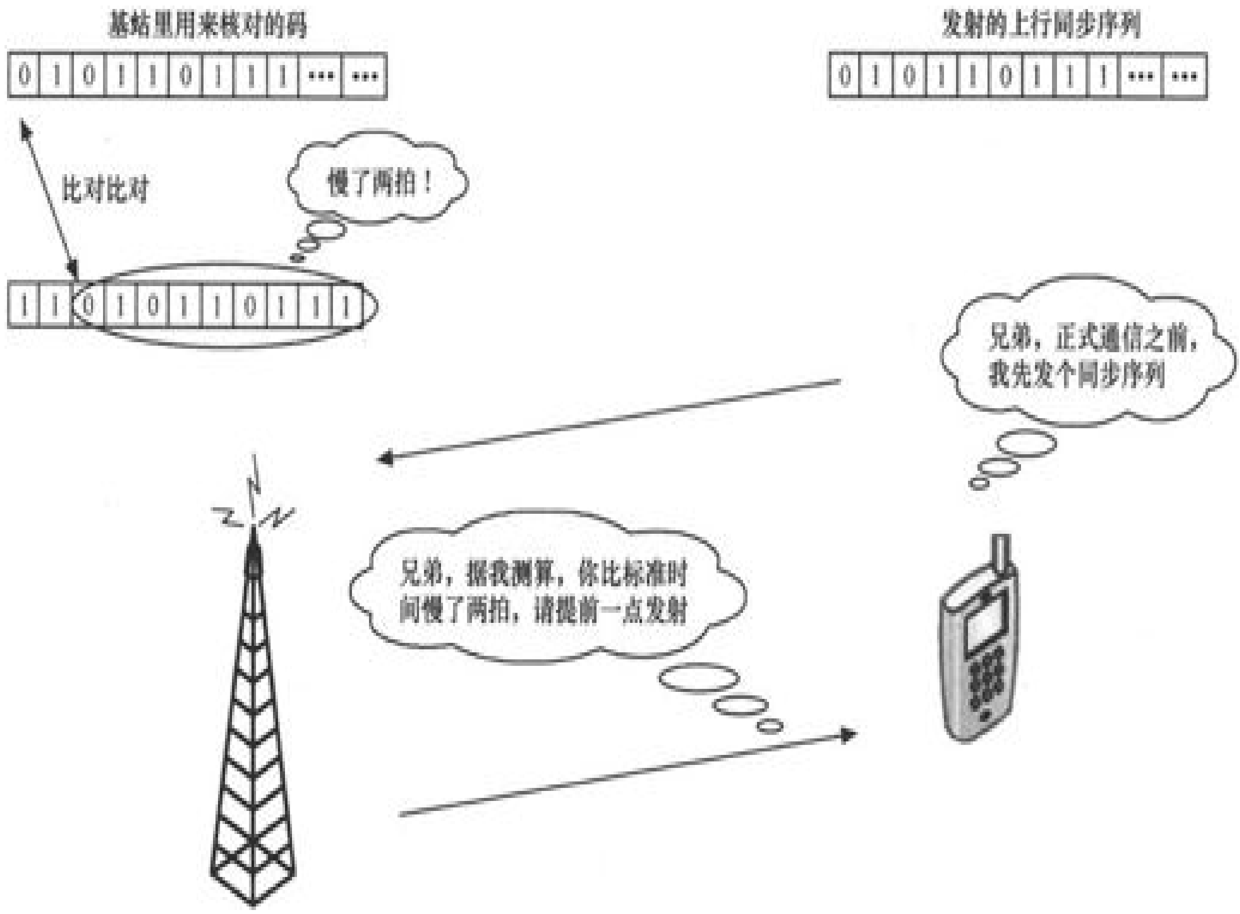
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□□5.17□□



□5.16 TD-SCDMA□□□□□□□



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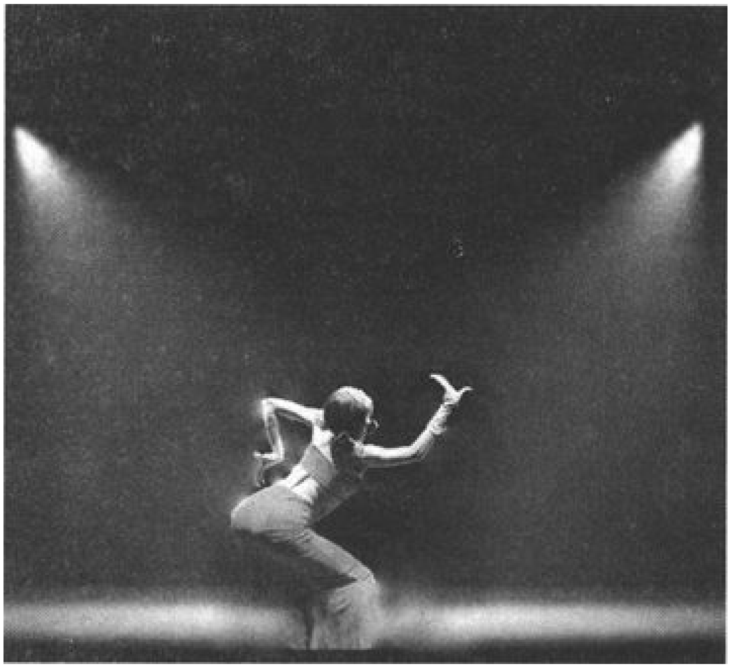
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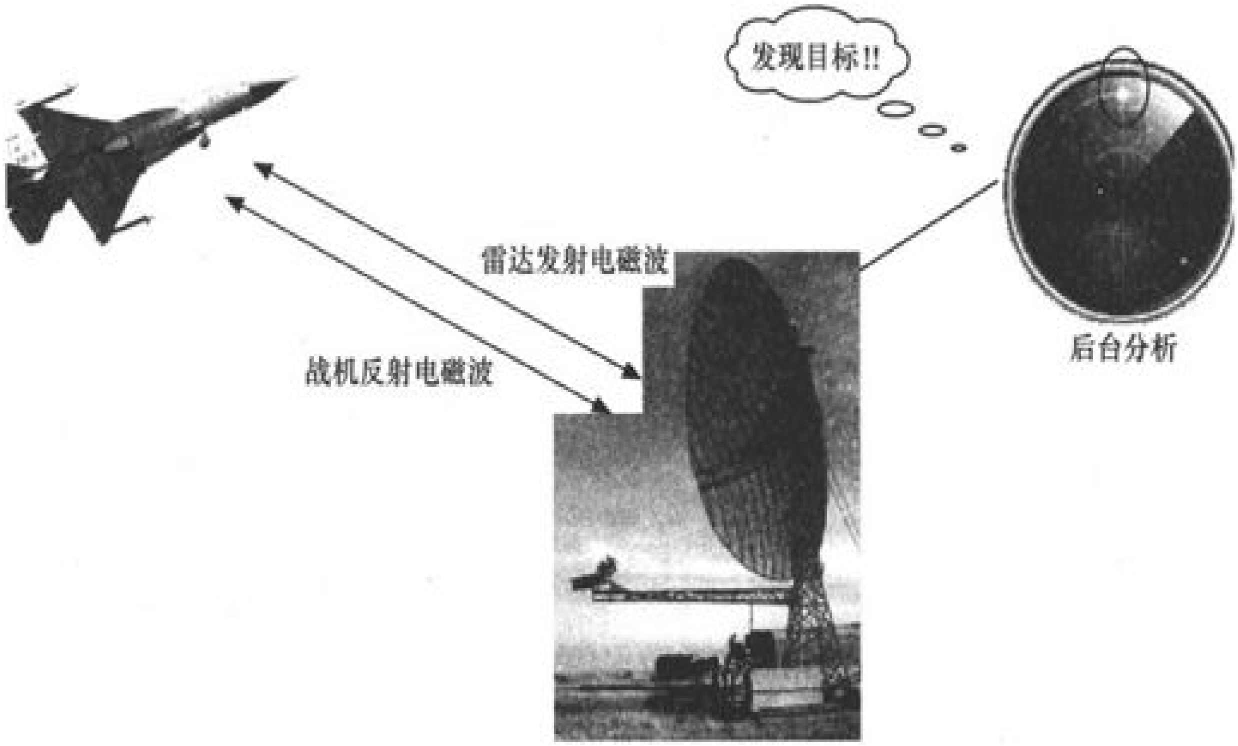
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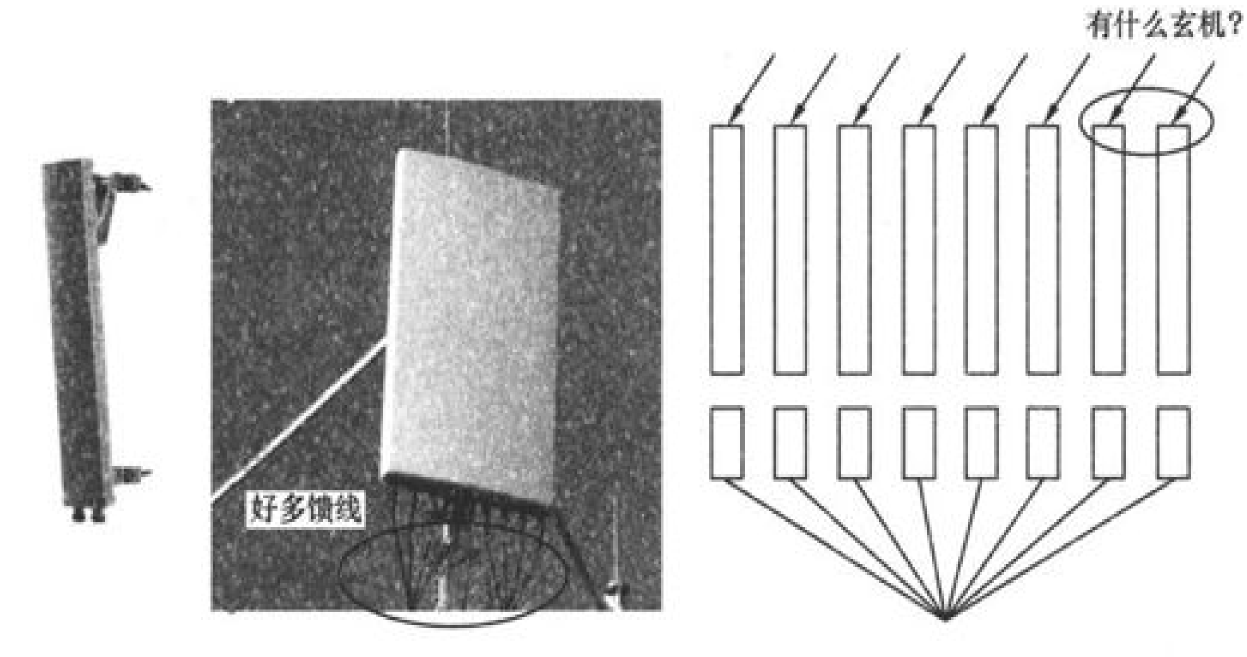


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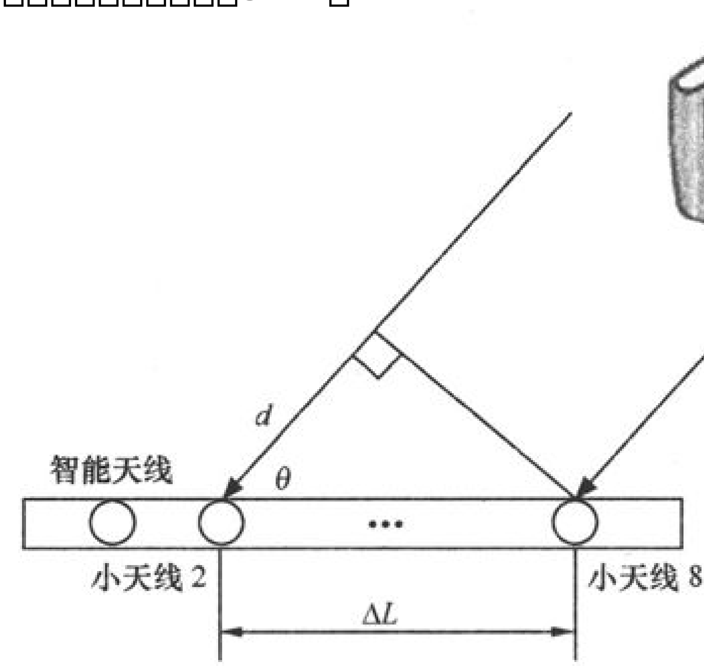
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（a）普通天线　（b）智能天线　（c）智能天线组成示意图

□**5.20**　□□□□□□□□

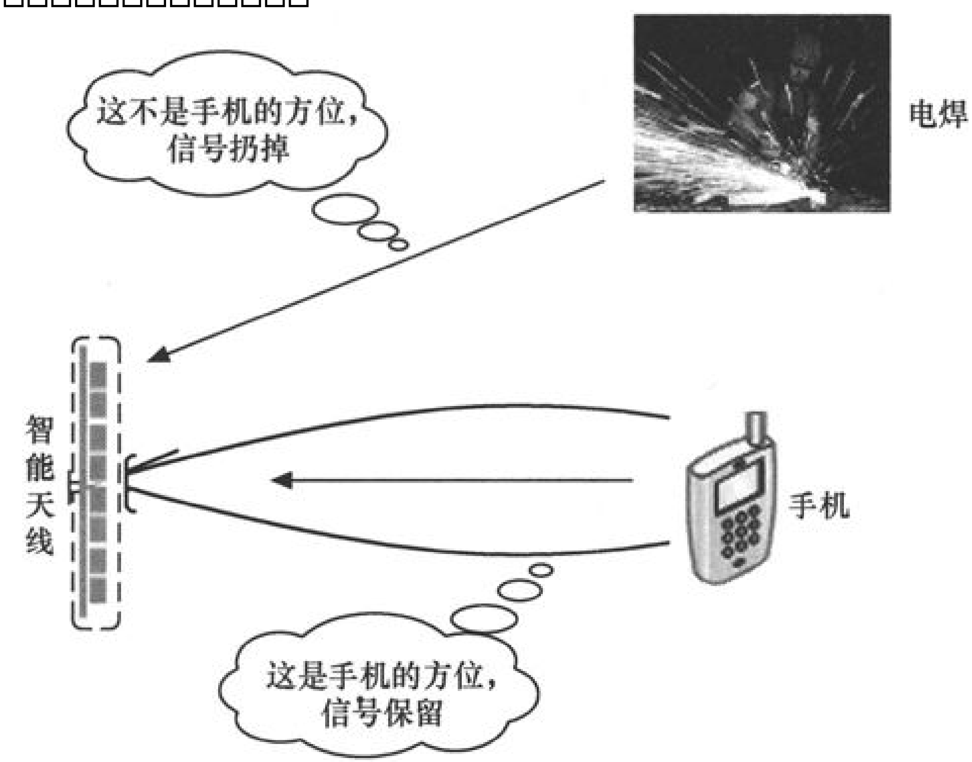
□□□□□□□□□□□TD-SCDMA□□□5.21□



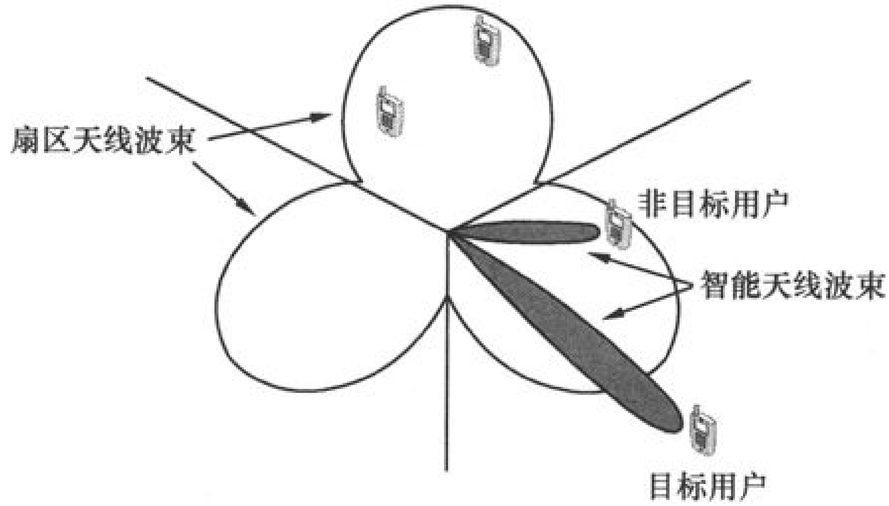
□**5.21**　□□□□□□□□

□5.21□□□□5.20□□□“□□□□□”□□□2□□□□8□□□□□□□□□□□□□□□2□□□□□d□□□□□□□2□□□□8□□□ΔL□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□θ□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

$$\theta = \arccos(d/L)$$



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[illegible]5.23 [illegible]

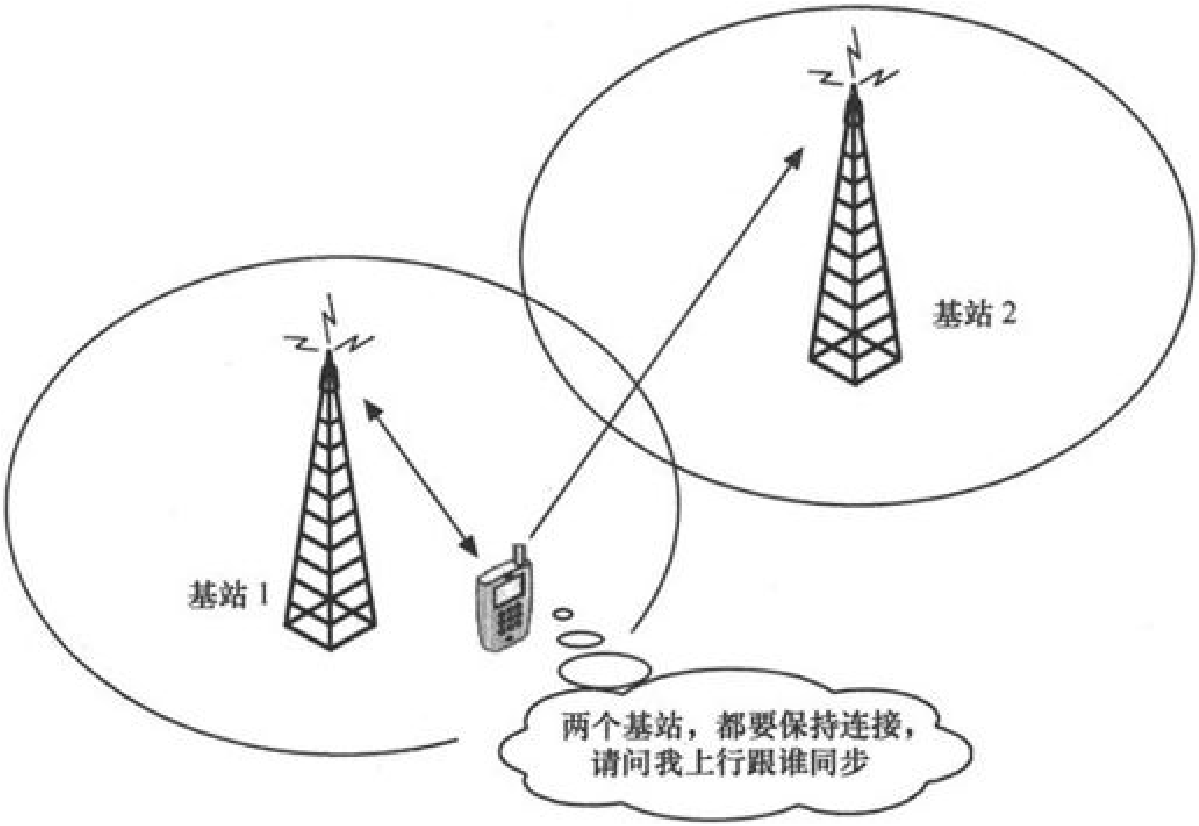
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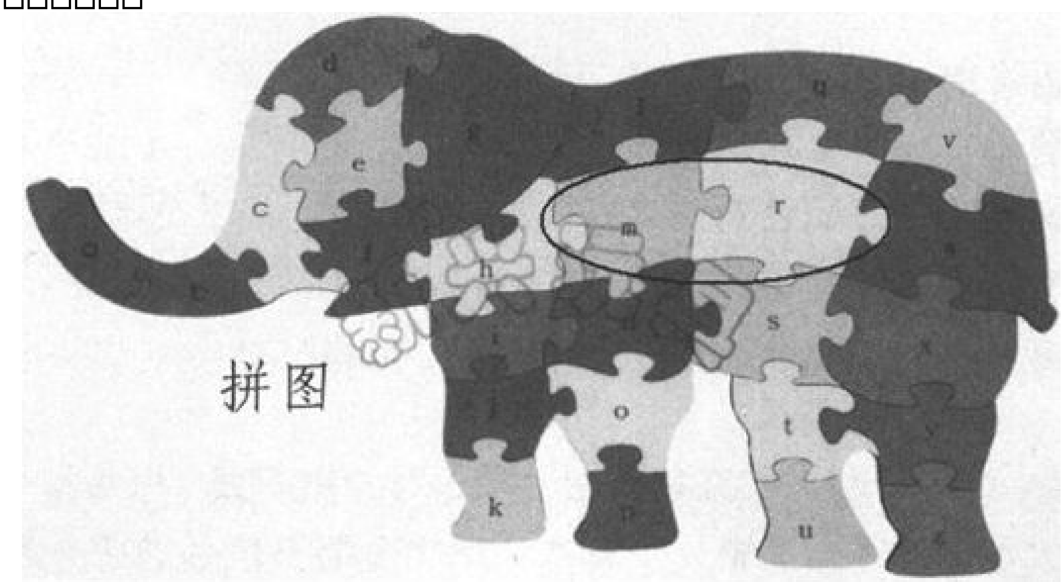
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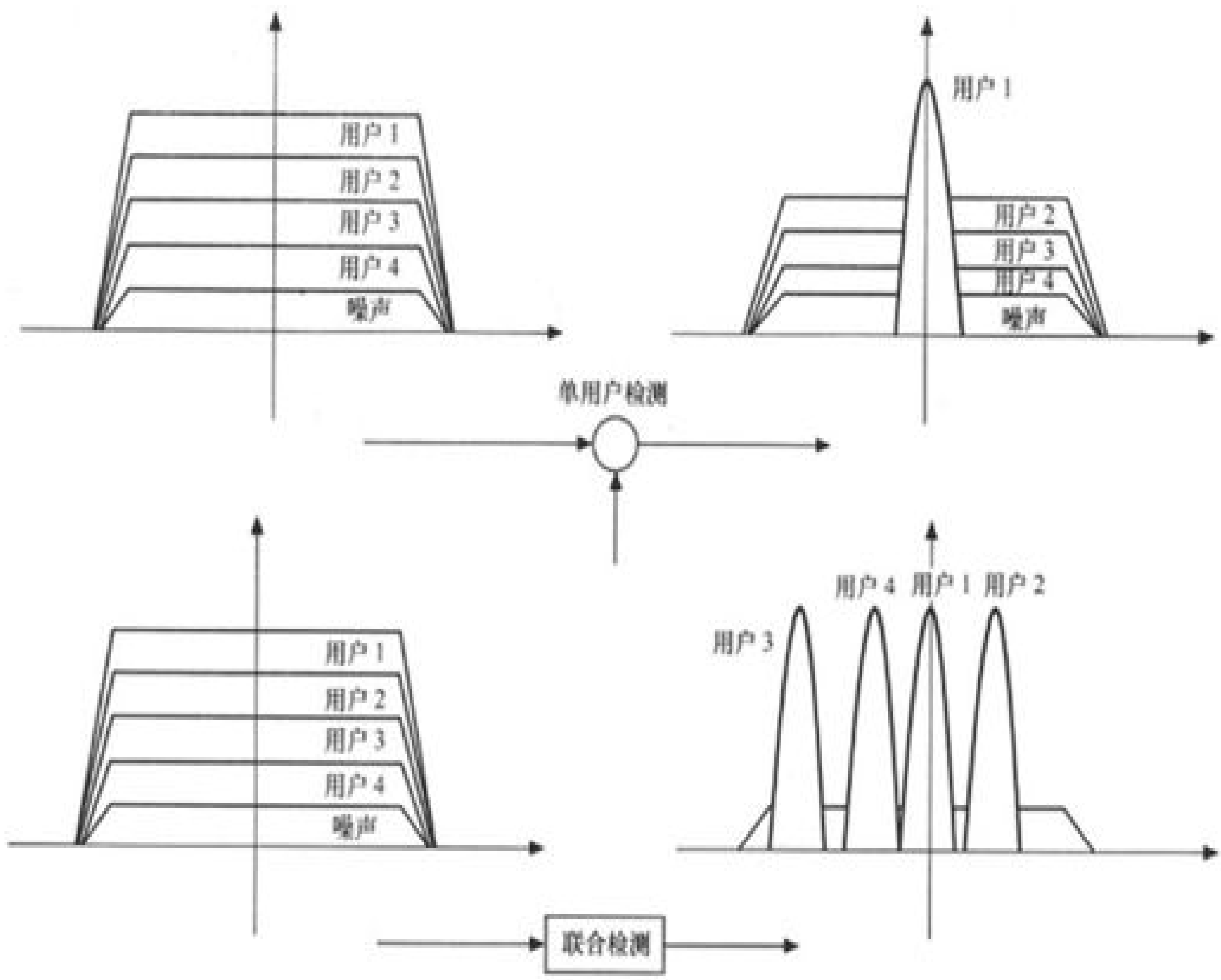
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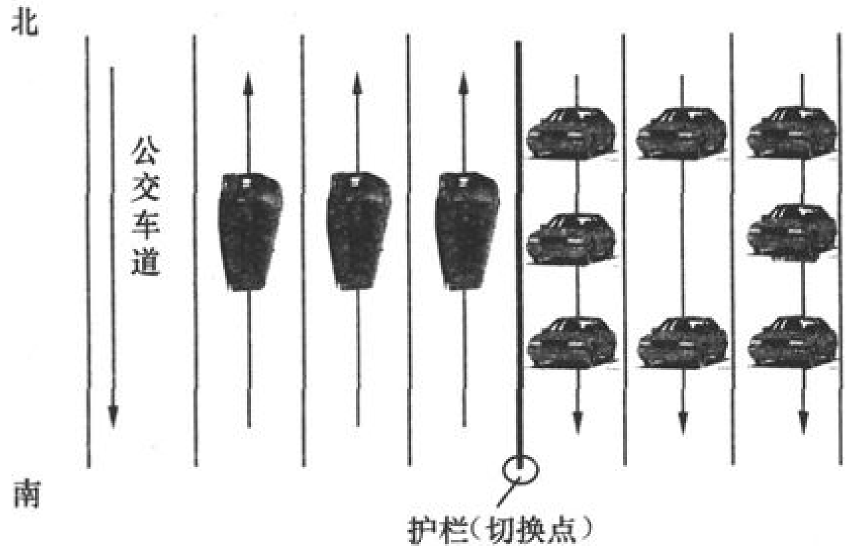
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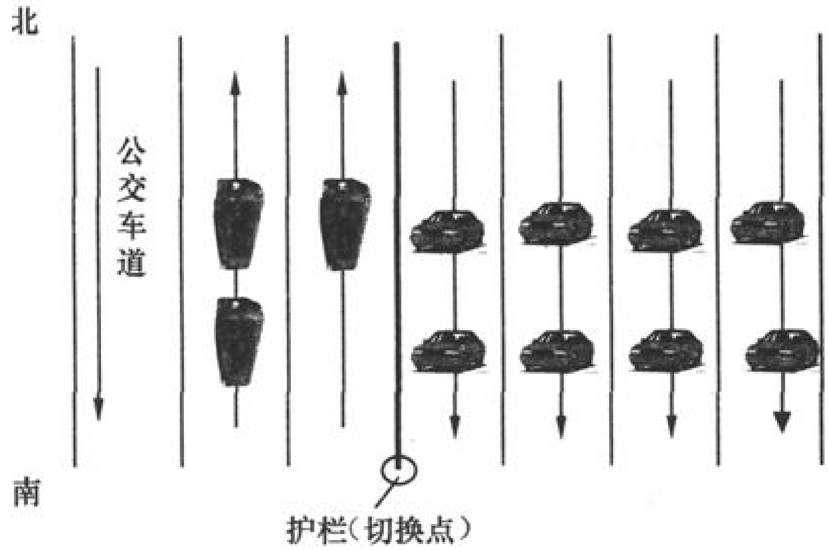
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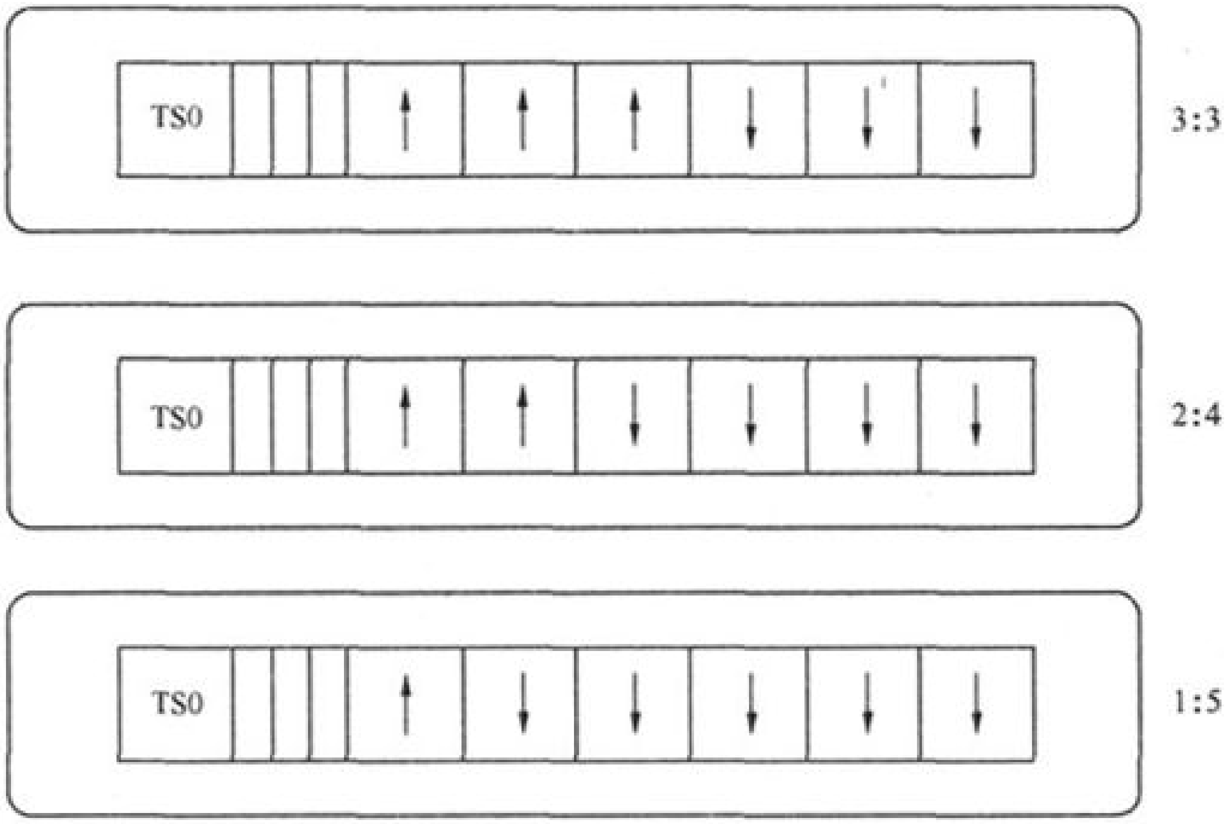


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□5.29　□□□□□□□□□□

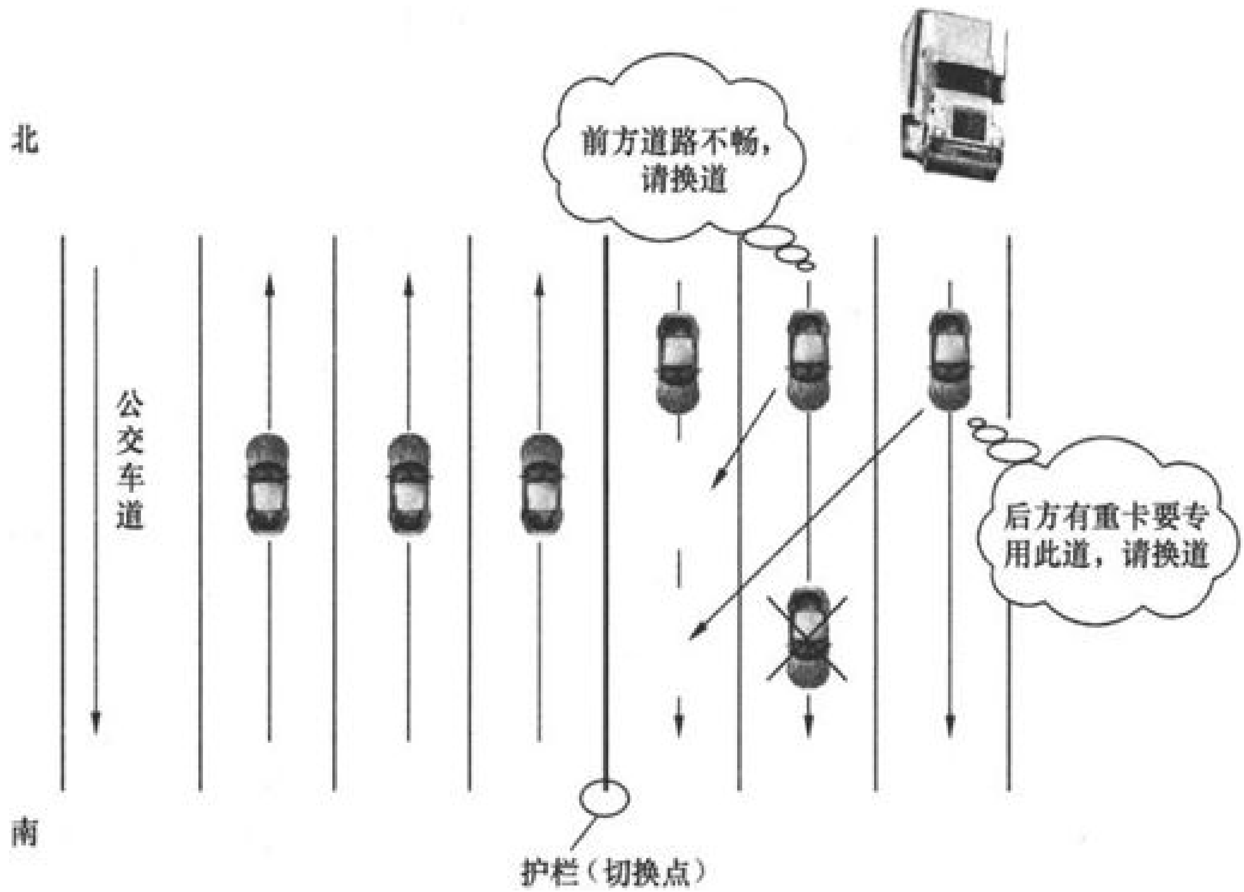
□5.28□□5.29□□TD-SCDMA□□□□□□DCA□Dynamic Channel Allocation□□□□□□□□□□□□TD-SCDMA□□□7□□□□□□□□TS0□0□□□□□□□□□□□□□□□□□6□□□□□□□□□□□RNC□□3:3□□□2:4□□□1:5□□□□□DCA□□□□□5.30□□□



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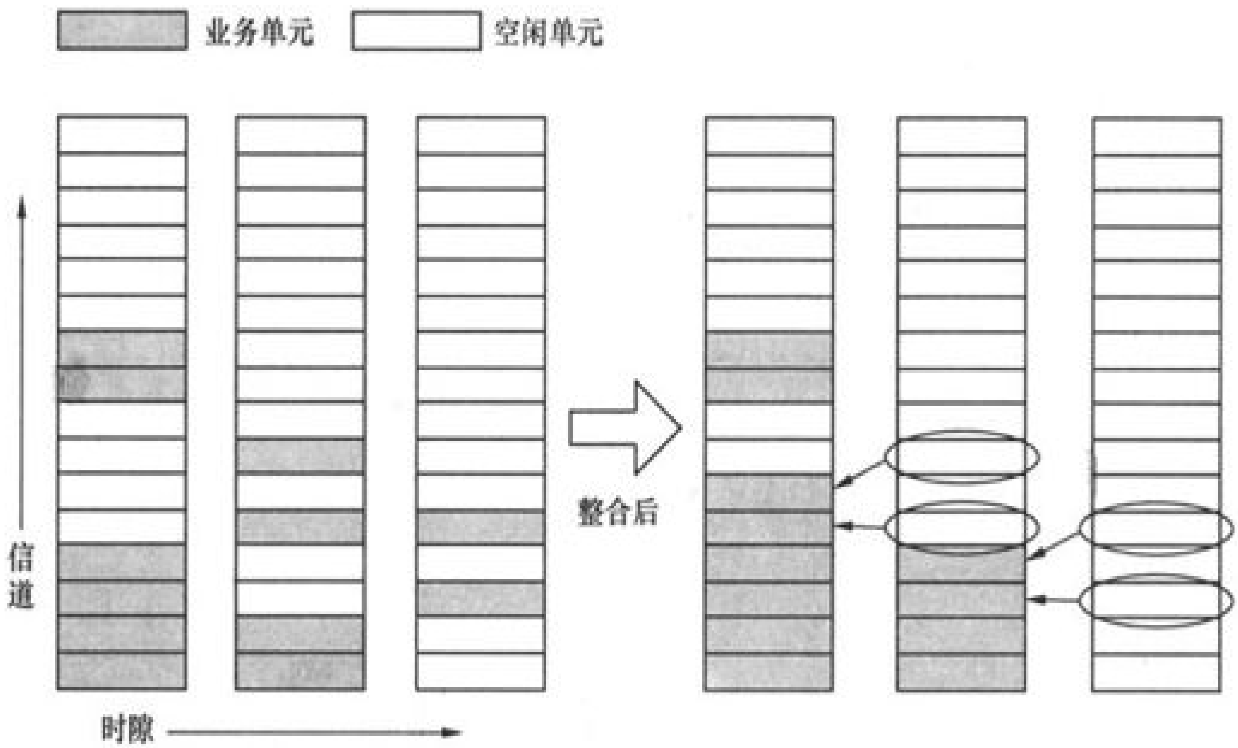
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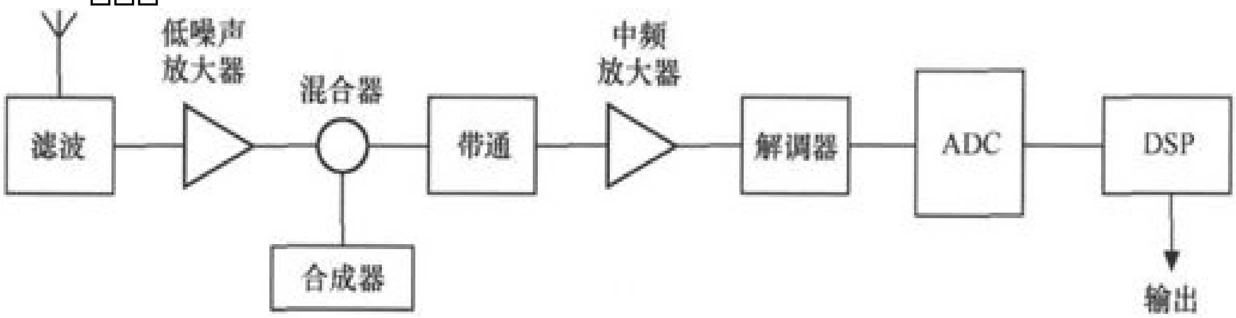
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□5-1　　　　　　　　□□□□

类　　别	种　　类
通信系统	GSM（GPRS、EDGE）、WCDMA（HSPA、HSPA+）、TD-SCDMA、cdma2000、LTE
调制方式	GMSK、QPSK、8PSK、16QAM、64QAM
多址方式	频分多址（FDMA）、码分多址（CDMA）、时分多址（TDMA）、空分多址（SDMA）

□□□“□□□□□□□□□□□□□□□□□□□□□□□□□□□□GSM□□□GSM□□□□WCDMA□□□WCDMA□□□□LTE□□□LTE……LTE□□□□□□□□□□□”

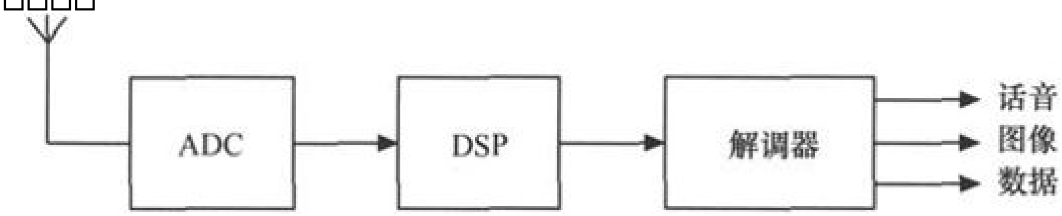
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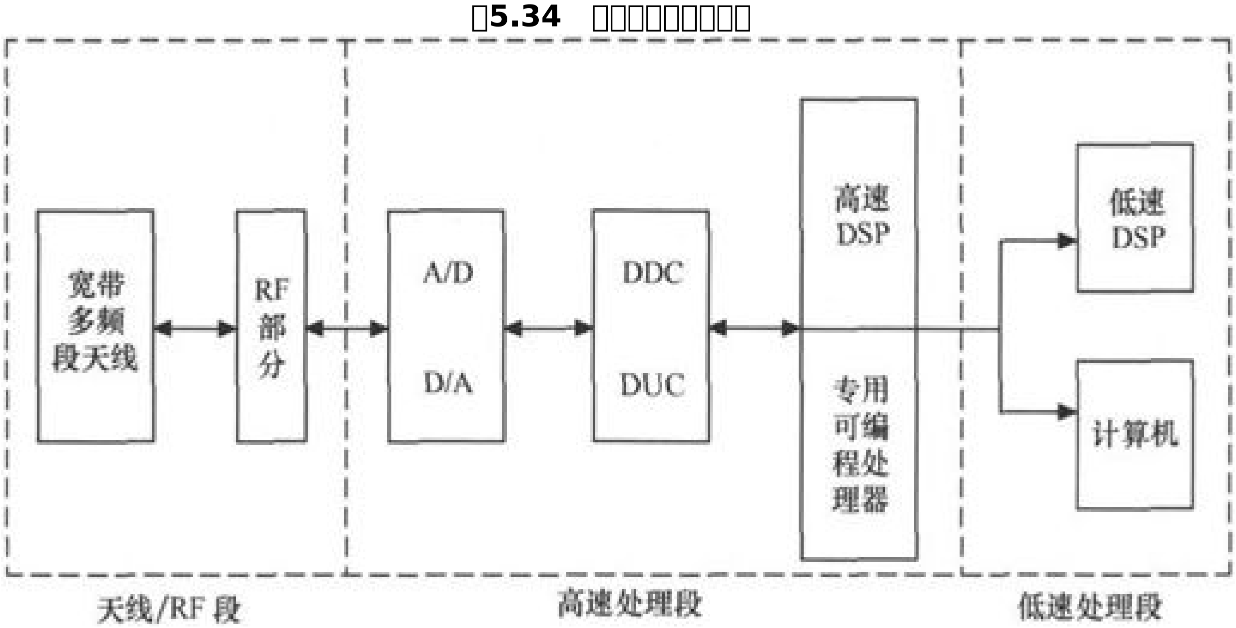
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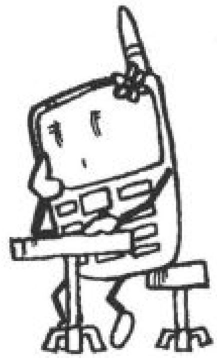
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□□□□□□□□□1998□12□□□□3GPP□□□□□□□□□□□□□□ETSI□European Telecommunications Standards Institute□□□□□□□□□□□□□□□GSM□□□□□□□□□□□ARIB□Association of Radio Industriesand Business□□□□□□□□□□□TTA□Telecommunication Technique Association□□□□□□□□□□□T1□□□□□□□□□□□GSM□□□□□□□□□□□CDMA□□□□□□□□□

3GPP□□□□□□□□□□□□□□□□□□□□□□□1999□1□□3GPP2□□□□□□□□□□□□TIA□Telecommunication Industry Association□□□□□□□□□□□ARIB□□□□TTA□□□□□□3GPP2□□□□□CDMA IS-95□□□□□cdma2000□□□□□□□□□□□□□□ANSI-41□□□□

1999□11□□ITU□□□□□□□□□□IMT-2000□□□□□□□□□□□□□□□□5□□□□3□□□□□□□□□□□□□□□□WCDMA□cdma2000□TD-SCDMA□

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□6-1　　　　　　□□3G□□□□

标　　准	WCDMA	cdma2000	TD-SCDMA
采用国家和地区	欧洲、日本	美国、韩国	中国
继承基础	GSM	CDMA IS-95	GSM
核心网	GSM MAP	ANSI-41	GSM MAP
工作频段	1 940～1 955MHz（上行）	1 920～1 935MHz（上行）	1 880～1 920MHz
	2 130～2 145MHz（下行）	2 110～2 125MHz（下行）	2 010～2 025MHz
双工方式	FDD	FDD	TDD
多址方式	FDMA+CDMA	FDMA+CDMA	FDMA+CDMA+TDMA+SDMA
载波带宽	5MHz	1.25MHz	1.6MHz

续表

标　准	WCDMA	cdma2000	TD-SCDMA
码片速率	3.84Mchip/s	1.228 8Mchip/s	1.28Mchip/s
峰值速率	14.4Mbit/s（下行）	3.1Mbit/s（下行）	2.8Mbit/s（下行）
	5.76Mbit/s（上行）	1.8Mbit/s（上行）	384kbit/s（上行）
基站间同步	异步	同步（GPS）	同步（GPS、北斗）
功率控制	快速功控（1 500Hz）	上行：800Hz	0～200Hz
		下行：慢速、快速功控	

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[illegible]TD-SCDMA[illegible]6-1[illegible]cdma2000[illegible]cdma2000[illegible]

[illegible]CDMA[illegible]IS-95[illegible]CDMA 1X[illegible]EV-DO[illegible]EV-DV[illegible]CDMA[illegible]CDMA[illegible]IS-95[illegible]CDMA 1X[illegible]CDMA 1X[illegible]——EV-DO[illegible]EV-DV[illegible]3GPP2[illegible]3GPP[illegible]PK[illegible]“GSM[illegible]”[illegible]“CDMA[illegible]”[illegible]IS-95[illegible]GSM[illegible]CDMA 1X[illegible]GPRS[illegible]EDGE[illegible]EV-DO[illegible]EV-DV[illegible]WCDMA[illegible]HSDPA[illegible]

6.1 CDMA[illegible]

[illegible]CDMA[illegible]3G[illegible]——[illegible]QUALCOMM[illegible]“quality communications”[illegible]

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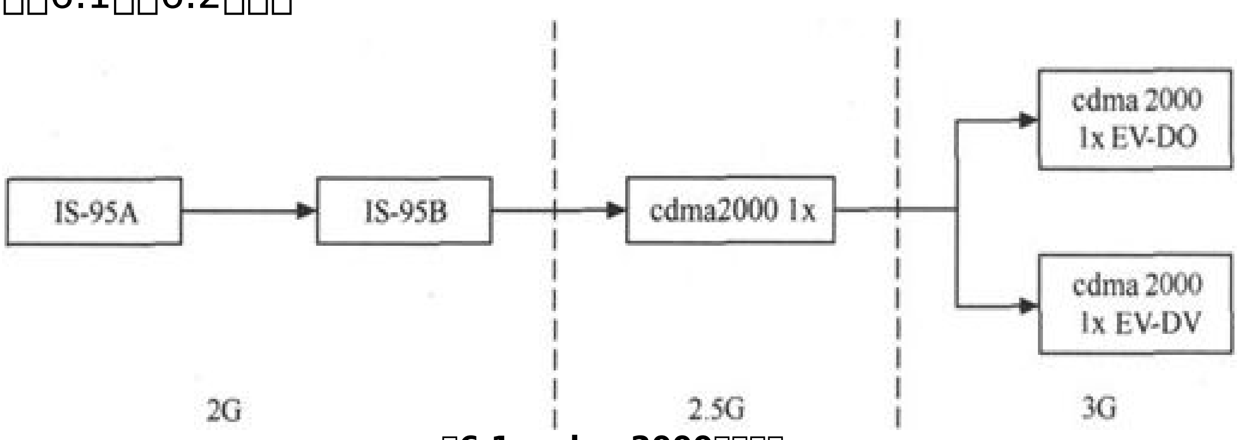
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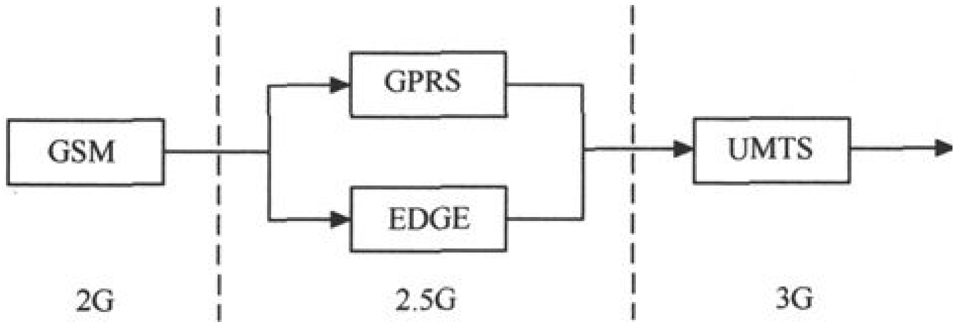
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□6.2 UMTS□□□□

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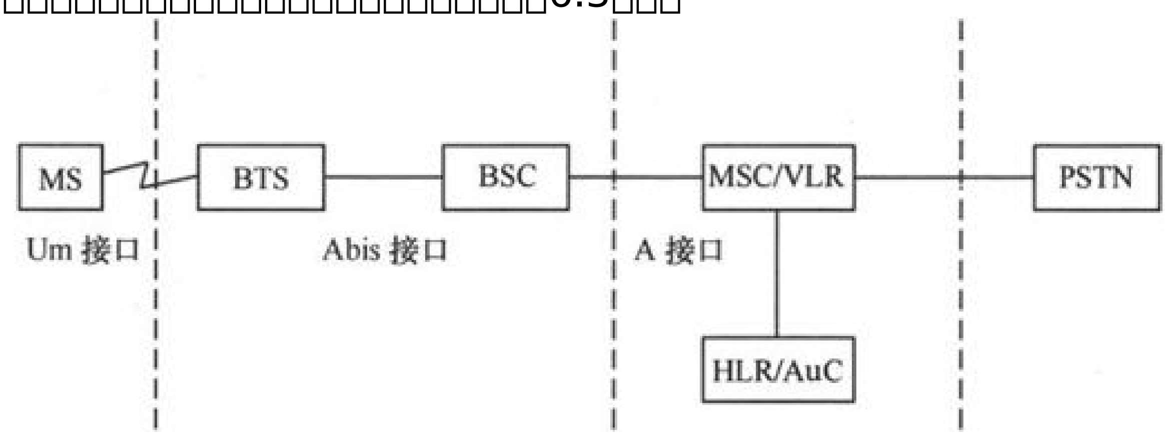
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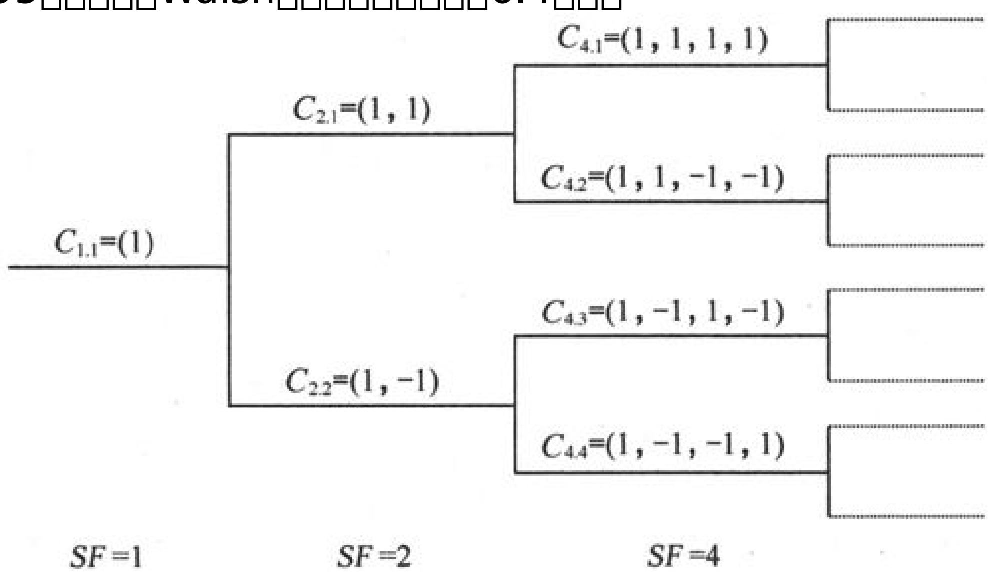
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IS-95□□□□□Walsh□□□□□□□□□□6.4□□□



□6.4 Walsh□

□□Walsh□□□□□□□□□□□□□□WCDMA□TD-SCDMA□□□□□□□□□□□IS-95□□□□□□□□□□□□□□WCDMA□TD-SCDMA□□□□□□□□□□□□□□□□WCDMA□□□□□4□512□□□□□□□□□□□4□256□□□□□TD-SCDMA□□□□□1□16□□□□□□□□□□□□□□□□□1□2□4□8□16□□□□□□IS-95□□□□□□□□□□□□□□SF□64□□□□□□□□□□64□□□□□W_0^{64}□W_1^{64}□W_2^{64}□…□W_{63}^{64}□□□□□□□□□□□□□□□□64□□□W_0^{64}□W_{63}^{64}□

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□6-2 □□□□□□

速率集（Rate Set）	支持速率
RS1	9.6kbit/s、4.8kbit/s、2.4kbit/s、1.2kbit/s
RS2	14.4kbit/s、7.2kbit/s、3.6kbit/s、1.8kbit/s

6.2.2 □□cdma2000□□□GPS

□□□□□TD-SCDMA□□□GPS□□□□TD-SCDMA□□GPS□□□□cdma2000□□GPS□□□□□□□□□□□

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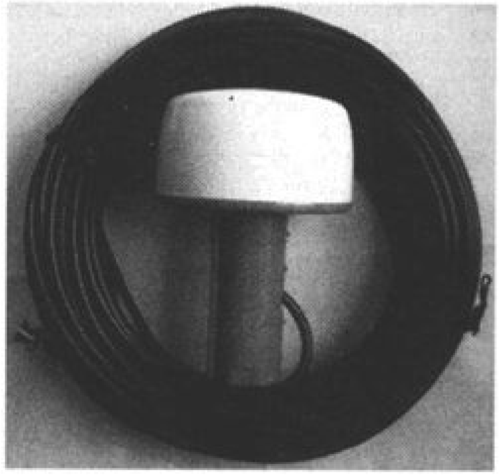
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□6.5 GPS□□

6.2.3 □——IS-95□

□ IS-95 □ 64 □ 64 □

□1□W_0——□ Pilot Channel □

□ Pilot □

□ 0 □

□ GSM □ FCCH □ WCDMA □ P-CPICH □
TD-SCDMA □ DwPTS □

□2□W_{32}——□ Synchronizing Channel □

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□ GSM □ SCH □ WCDMA □ P-SCH
□ S-SCH □ TD-SCDMA □ DwPTS □

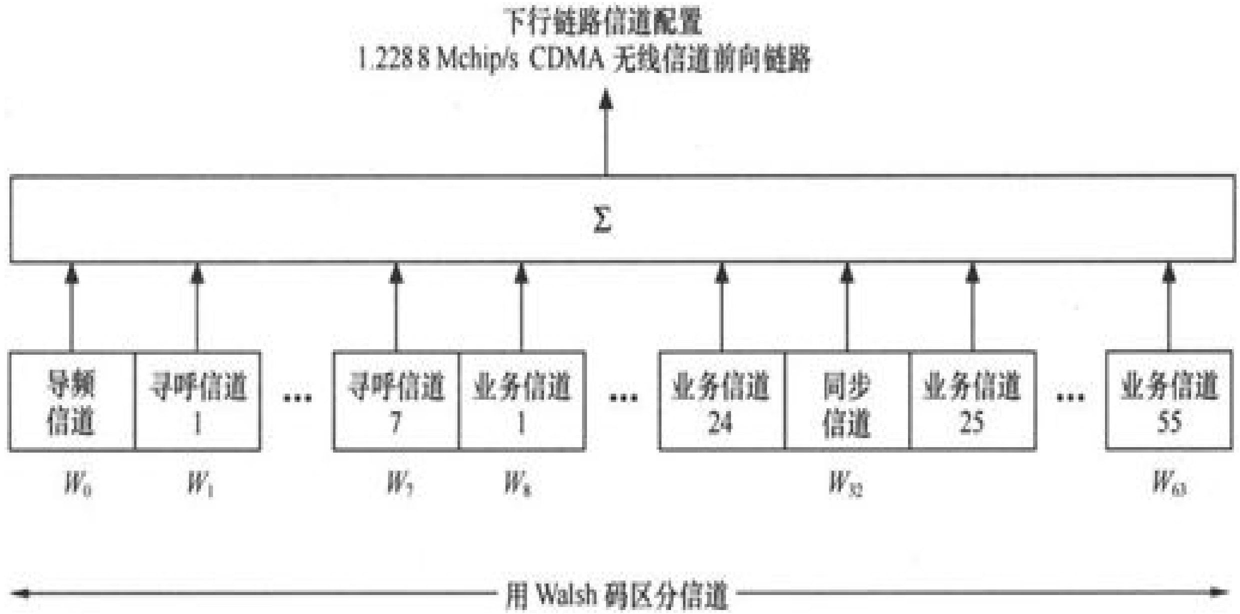
□3□W_1□W_7——□ Paging Channel □

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6.3.1 [illegible]

[illegible]CDMA 1X[illegible]GPRS[illegible]

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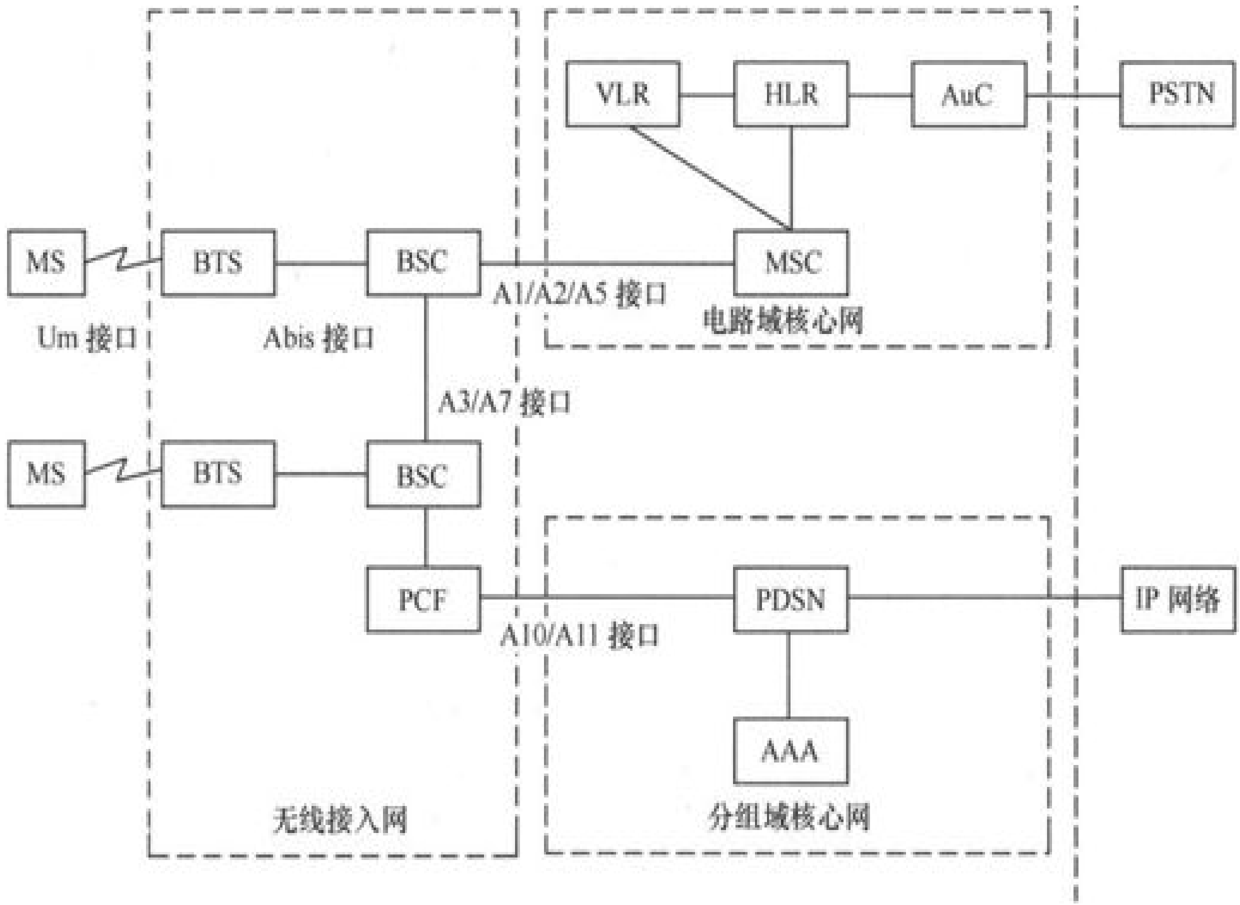
cdma2000[illegible]IS-95[illegible]IS-95[illegible]IS-95[illegible]ANSI-41[illegible]

6.3.2 [illegible]——[illegible]

GSM[illegible]GPRS[illegible]IS-95[illegible]1x[illegible]GPRS[illegible]GSM[illegible]GPRS[illegible]GSM[illegible]6.7[illegible]6.8[illegible]GSM[illegible]CDMA[illegible]

[illegible]cdma2000 1x[illegible]CDMA IS-95[illegible]3[illegible]

[illegible]1[illegible]PCF [illegible]Packet Control Function[illegible]BSC[illegible]



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□2□PDSN□Packet Data Serving Node□□□□□□□□□□□PDSN□□□□□□□□□□□□□□□□□□IP□□□□□□□□□□□□□□□□□□□□□□□□□□□□□IP□□□□□□□□□□□□□

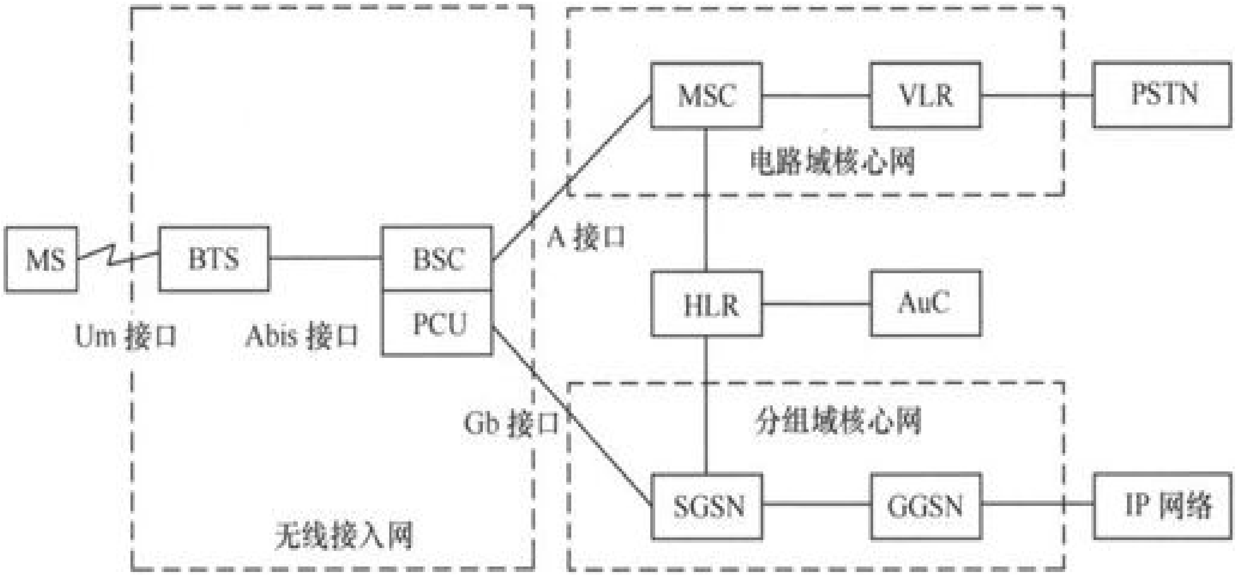
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□6-3 CDMA 1X□□□□□□□RC□□□□

RC	支持制式	最大速率	信道编码方式	调制方式
1	IS-95 CDMA 1X	9.6kbit/s	1/2（卷积码）	BPSK
2		14.4kbit/s	1/2（卷积码）	BPSK
3	CDMA 1X	153.6kbit/s	1/4（卷积码/Turbo 码）	QPSK
4		307.2kbit/s	1/2（卷积码/Turbo 码）	QPSK
5		230.4kbit/s	1/4（卷积码/Turbo 码）	QPSK

□□□□IS-95□□□RC1□RC2□□□□□9.6kbit/s□14.4kbit/s□□□□
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1228.8 kchip/s/4[illegible]×2[illegible]QPSK[illegible]×$\frac{1}{2}$[illegible]1/2[illegible]307.2kbit/s

[illegible]GPRS[illegible]171.2kbit/s[illegible]GPRS[illegible]EDGE[illegible]473.6kbit/s[illegible]CDMA 1X[illegible]EDGE[illegible]CDMA 1X[illegible]EDGE[illegible]CDMA 1X[illegible]EV-DO[illegible]EV-DV[illegible]

6.4 [illegible]3G[illegible]——EV-DO[illegible]EV-DV

[illegible]QoS[illegible]

[illegible]QoS[illegible]

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[illegible]CDMA 1X[illegible]IMT-2000[illegible]2G[illegible]EV-DO[illegible]EV-DV[illegible]

6.4.1 [illegible]——EV-DO

[illegible]20[illegible]

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6.4.2 [illegible]——EV-DV

EV-DV[illegible]

CDMA 1X EV-DO[illegible]DO[illegible]

[illegible]1X EV-DV[illegible]DV[illegible]Data&Voice[illegible]

3GPP2[illegible]2000[illegible]EV-DV[illegible]3GPP2[illegible]2002[illegible]5[illegible]EV-DV[illegible]IMT-2000[illegible]Rev.C[illegible]2004[illegible]3[illegible]3GPP2[illegible]Rev.D[illegible]HSDPA[illegible]HSUPA[illegible]

CDMA 1X EV-DV[illegible]3.1Mbit/s[illegible]1.8Mbit/s[illegible]EV-DO[illegible]EV-DV[illegible]1X[illegible]

[illegible]CDMA[illegible]CDMA 1X[illegible]EV-DV[illegible]EV-DV[illegible]1X[illegible]EV-DO[illegible]EV-DV[illegible]HSDPA[illegible]

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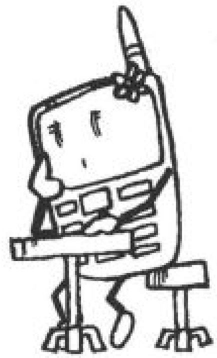
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	WiMAX	HSDPA
频率范围	16d：2～11GHz	上行：1 920～1 980MHz
	16e：≤6GHz	下行：2 110～2 170MHz
信道带宽	16d：1.25～20 MHz	5 MHz
	16e：1.25～20 MHz	
应用地域	16d：主要在北美和欧洲	起源：日本
	16e：起初在韩国	发展：欧洲、美国和韩国

续表

	WiMAX	HSDPA
基本业务	16d：固定宽带无线接入，点对点中继	高速移动数据
	16e：移动宽带无线接入	
最大吞吐量	16d：75 Mbit/s(20MHz 带宽下)	14.4 Mbit/s(5MHz 带宽下)
	16e：30 Mbit/s(10MHz 带宽下)	

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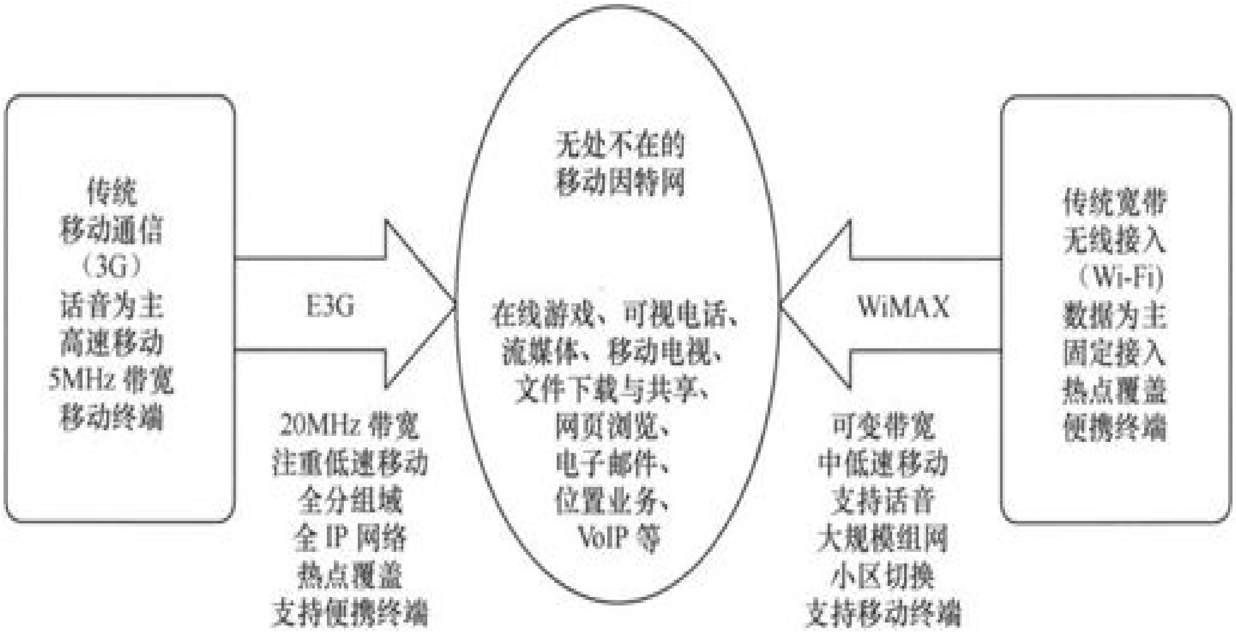
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[illegible]7.1 [illegible]

“[illegible]”[illegible]WiMAX[illegible]802.16d[illegible]802.16e[illegible]IEEE[illegible]

[illegible]“[illegible]”[illegible]5MHz[illegible]20MHz[illegible]2G[illegible]3G[illegible]LTE[illegible]3GPP[illegible]3GPP2[illegible]IP[illegible]IP[illegible]

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[illegible]2[illegible]3GPP R6[illegible]2[illegible]4[illegible]

[illegible]3[illegible]10ms[illegible]“[illegible]”[illegible]

[illegible]4[illegible]1.4MHz[illegible]3.0MHz[illegible]5MHz[illegible]10MHz[illegible]15MHz[illegible]20MHz[illegible]WiMAX[illegible]LTE[illegible]5MHz[illegible]20MHz[illegible]LTE[illegible]LTE[illegible]LTE[illegible]

[illegible]LTE[illegible]

7.4 [illegible]——LTE[illegible]OFDM

[illegible]2Mbit/s[illegible]4Mbit/s[illegible]8Mbit/s[illegible]20Mbit/s[illegible]

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[illegible]20Mbit/s[illegible]CDMA[illegible]3GPP[illegible]CDMA[illegible]

[illegible]WiMAX[illegible]OFDM[illegible]Orthogonal Frequency Division Multiplexing[illegible]

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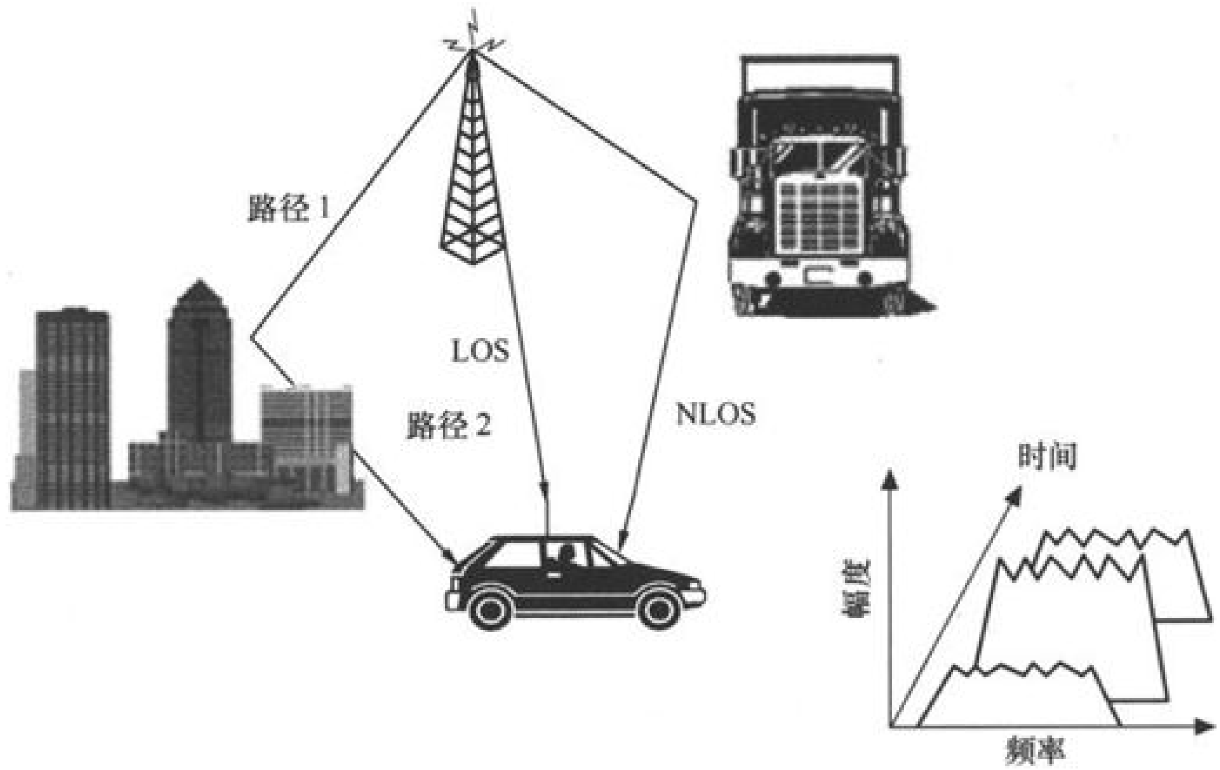
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[illegible]TD-SCDMA[illegible]“TD”[illegible]“S”[illegible]“CDMA”[illegible]3[illegible]3[illegible]OFDM[illegible]OFDM[illegible]“O”[illegible]“FDM”[illegible]“WCDMA”[illegible]“cdma2000”[illegible]

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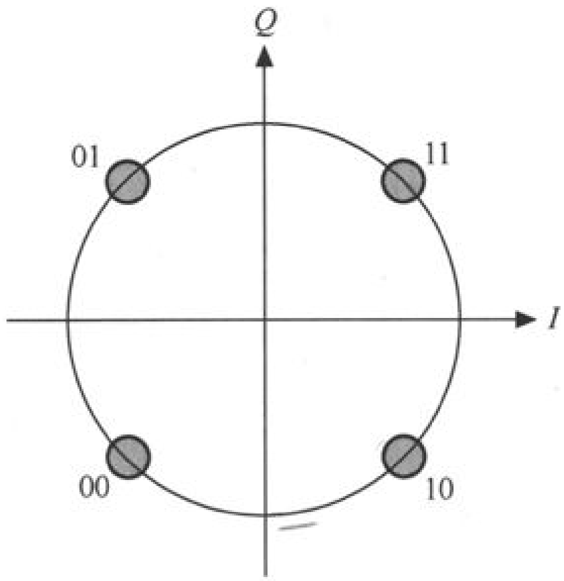
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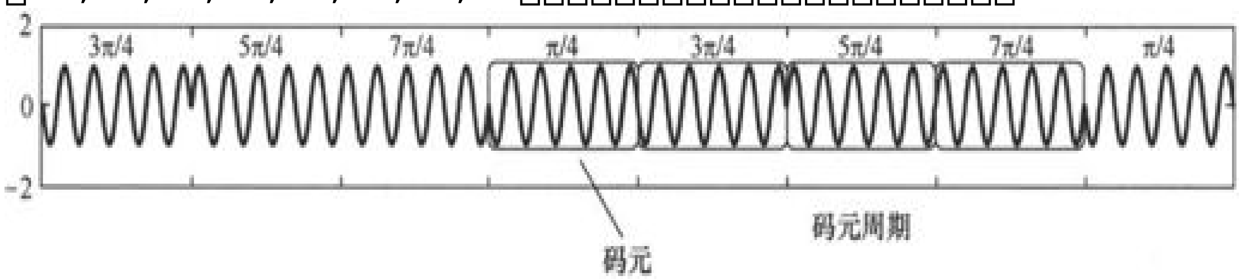
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[illegible]ISI, Inter Symbol Interference[illegible]QPSK[illegible]



□7.3 QPSK□□

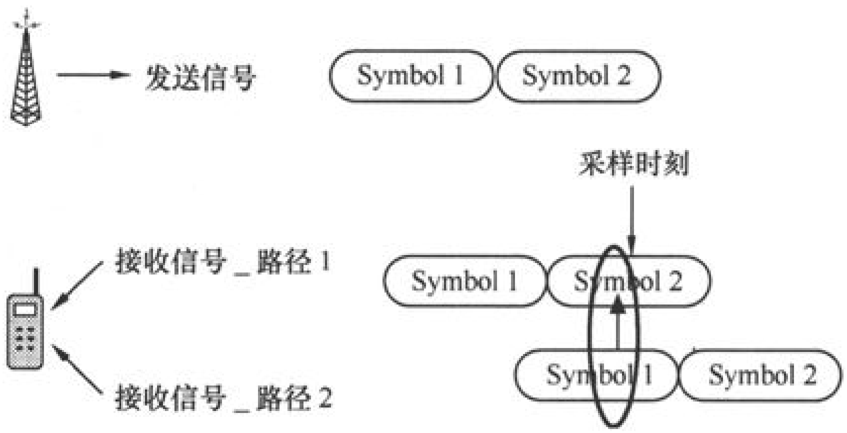
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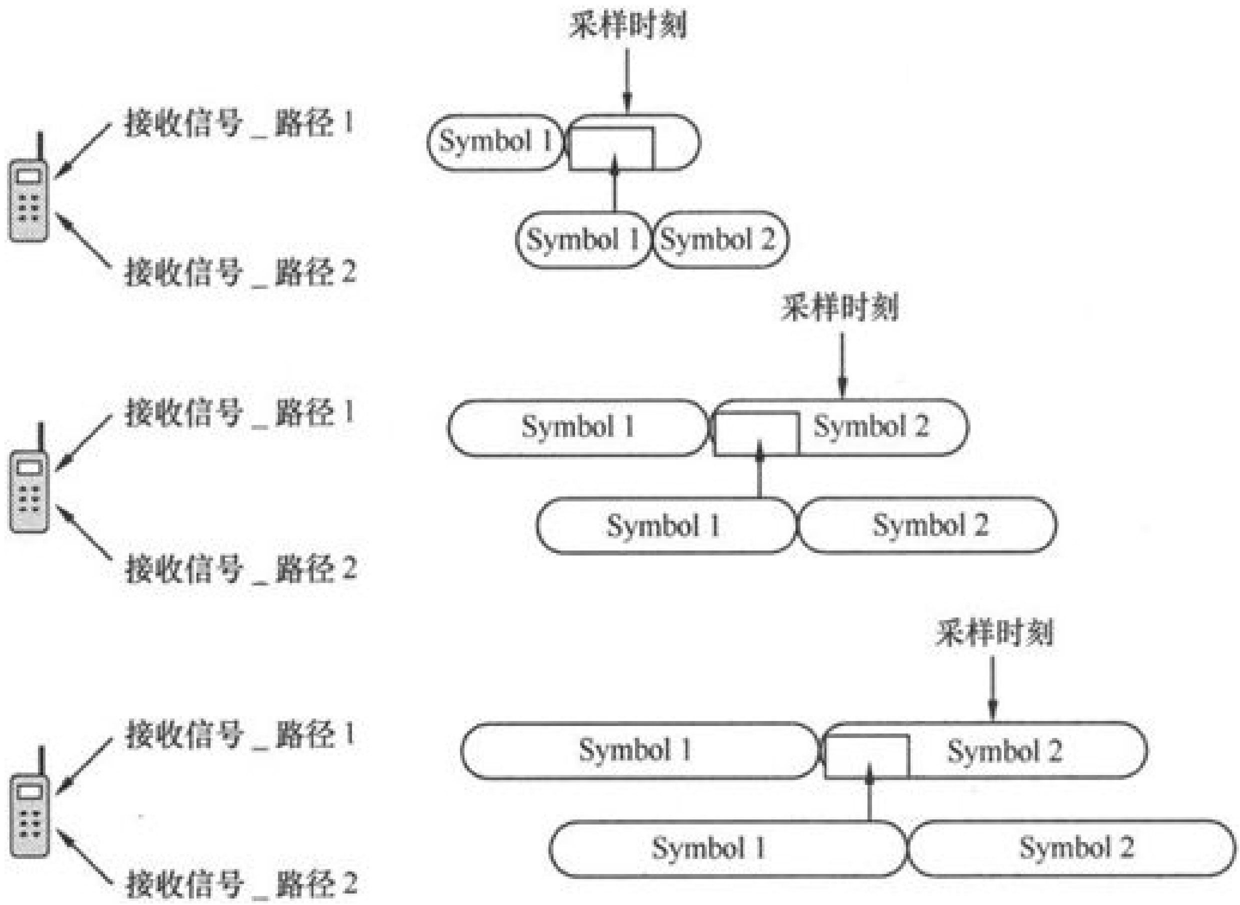
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[illegible]2[illegible]1[illegible]2[illegible]1[illegible]1[illegible]2[illegible]

[illegible]7.6[illegible]7.6[illegible]1[illegible]2[illegible]3[illegible]3[illegible]3[illegible]

[illegible]7.6[illegible]



[illegible]7.6 [illegible]

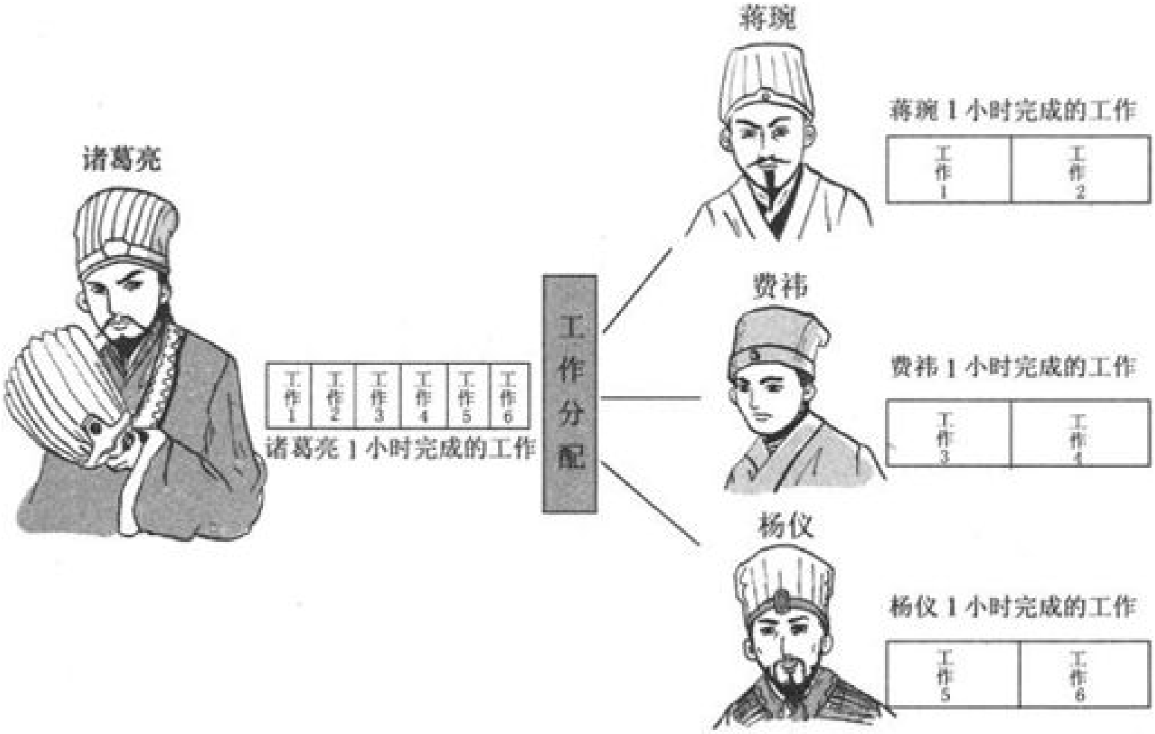
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[illegible]3GPP[illegible]WiMAX[illegible]IEEE[illegible]3GPP[illegible]

[illegible]3GPP[illegible]3[illegible]

[illegible]3[illegible]1/3[illegible]1/3[illegible]

[illegible]“3[illegible]”[illegible]3[illegible]3[illegible]1/3[illegible]3[illegible]



[illegible]7.7 [illegible]

[illegible]“[illegible]”[illegible]1/3[illegible]“[illegible]”[illegible]3[illegible]“[illegible]”[illegible]“[illegible]”[illegible]3[illegible]3[illegible]

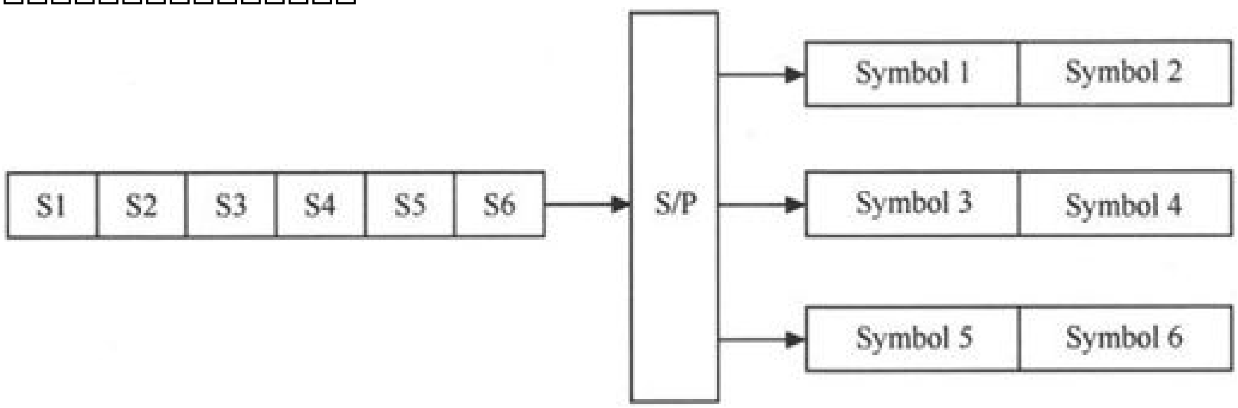
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[illegible]

[illegible]QPSK[illegible]2[illegible]1[illegible]16QAM[illegible]4[illegible]1[illegible]

[illegible]N[illegible]N[illegible]1/N[illegible]1/N[illegible]N[illegible]N×1/N[illegible]1[illegible]N[illegible]

[illegible]N[illegible]N[illegible]1/N[illegible]N[illegible]OFDM[illegible]“FDM”[illegible]2[illegible]OFDM[illegible]7.8[illegible]7.7[illegible]



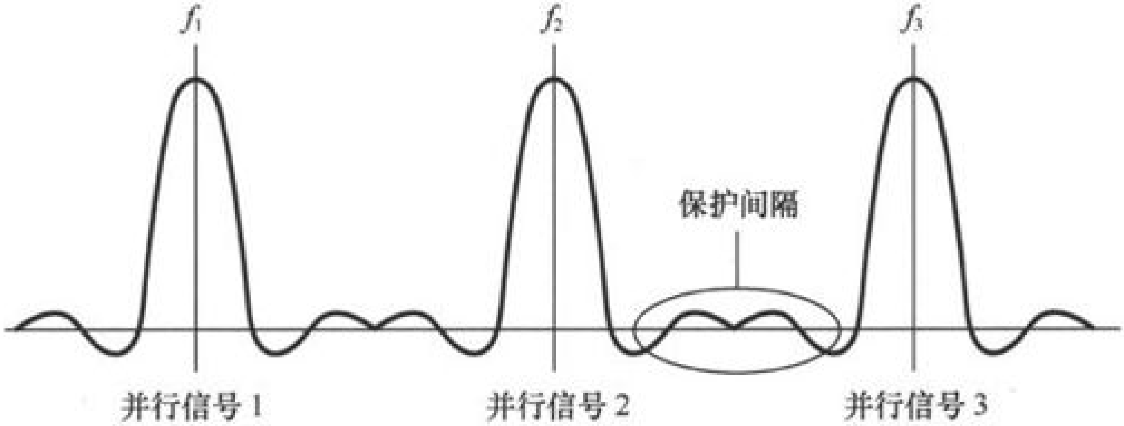
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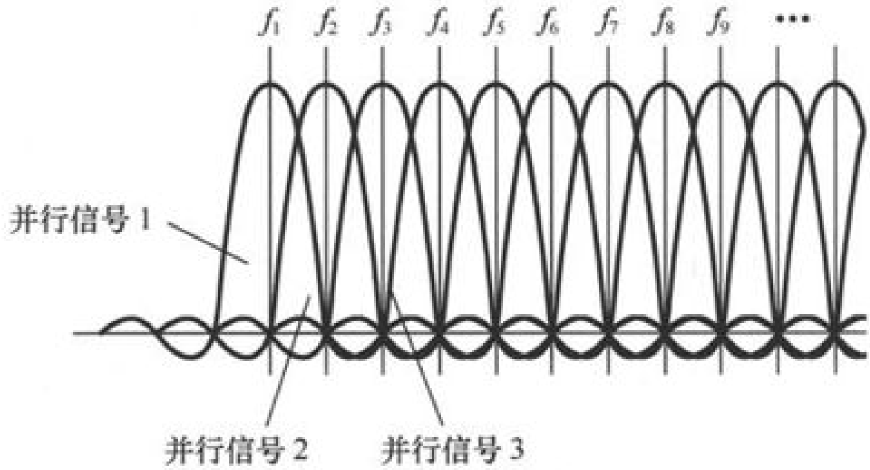
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7.4.2 [illegible]——[illegible]OFDM[illegible]“O”

[illegible]7.8[illegible]“FDM”[illegible]“OFDM”[illegible]FDM[illegible]FDM[illegible]7.9[illegible]a[illegible]



（a）传统 FDM 频谱



（b）OFDM 频谱

[illegible]7.9 FDM[illegible]OFDM[illegible]

[illegible]FDM[illegible]OFDM[illegible]7.8[illegible]3[illegible]OFDM[illegible]FDM[illegible]7.9[illegible]

[illegible]

[illegible]f_1[illegible]ω_0[illegible]f_2[illegible]$2\omega_0$[illegible]ω_0[illegible]$\sin\omega_0 t$[illegible]$\sin 2\omega_0 t$[illegible]$\sin 3\omega_0 t$[illegible]…[illegible]

$$\frac{2}{T}\int_{-\frac{T}{2}}^{\frac{T}{2}} \sin m\omega_0 t \times \sin m\omega_0 t = \frac{2}{T}\int_{-\frac{T}{2}}^{\frac{T}{2}} \frac{1}{2}(1-\cos 2m\omega_0 t) = 1 \qquad (7.1)$$

[illegible]$\sin m\omega_0 t$[illegible]m[illegible]$\sin m\omega_0 t$[illegible]$\sin m\omega_0 t$[illegible]$n \neq m$[illegible]

$$\begin{cases} \dfrac{2}{T}\int_{-\frac{T}{2}}^{\frac{T}{2}} \sin m\omega_0 t \times \cos n\omega_0 t = 0 \\ \dfrac{2}{T}\int_{-\frac{T}{2}}^{\frac{T}{2}} \sin m\omega_0 t \times \sin n\omega_0 t = 0 \end{cases} \quad (n \neq m) \qquad (7.2)$$

[illegible]0[illegible]OFDM[illegible]“O”[illegible]“FDM”[illegible]7.1[illegible]7.2[illegible]

[illegible]7.10[illegible]3[illegible]3[illegible]7.8[illegible]7.9[illegible]$\sin m\omega_0 t$[illegible]$\sin m\omega_0 t$[illegible]0[illegible]OFDM[illegible]$\cos m\omega_0 t$[illegible]$\sin m\omega_0 t$[illegible]90°[illegible]$\sin m\omega_0 t$[illegible]7.10[illegible]OFDM[illegible]

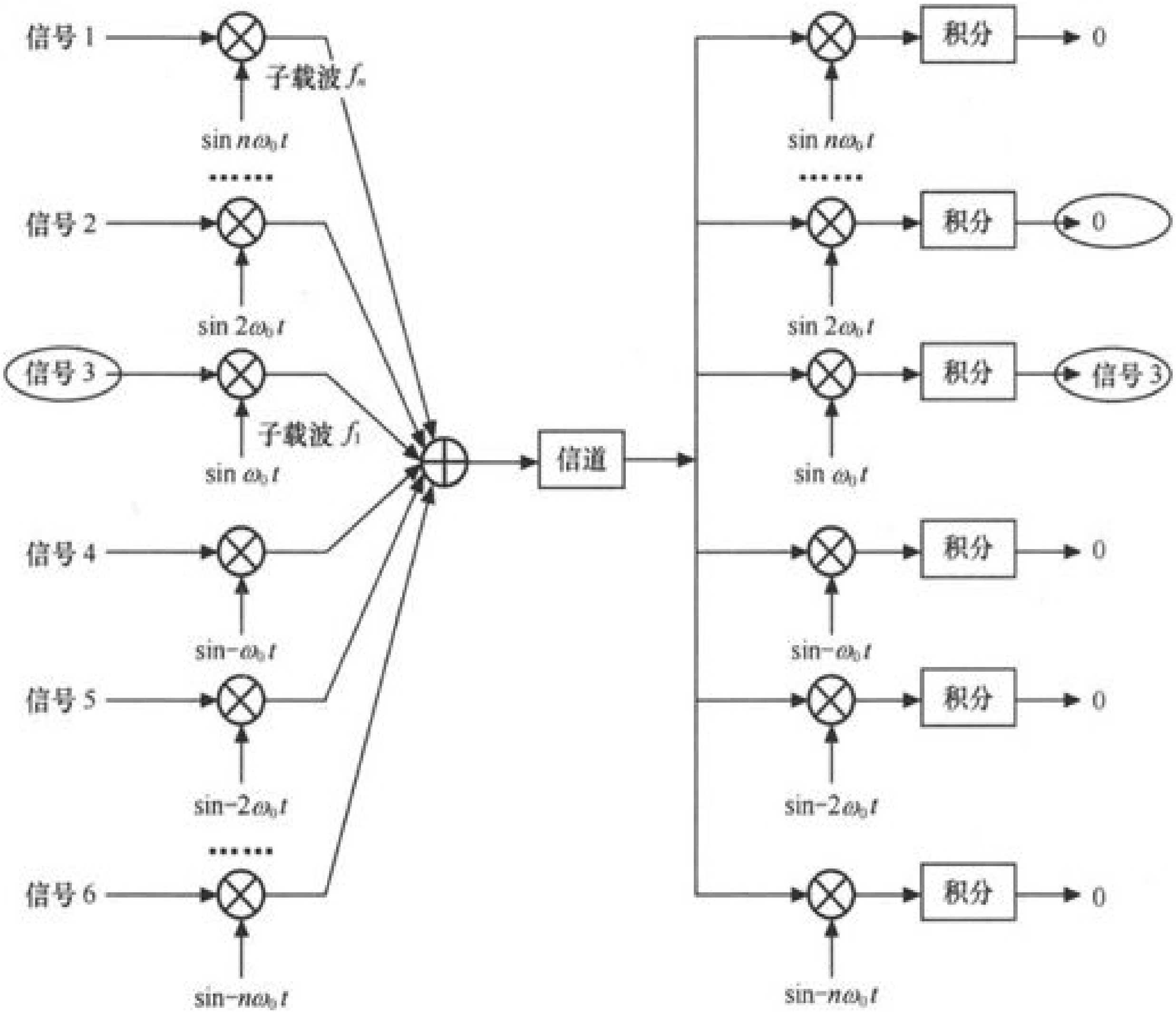
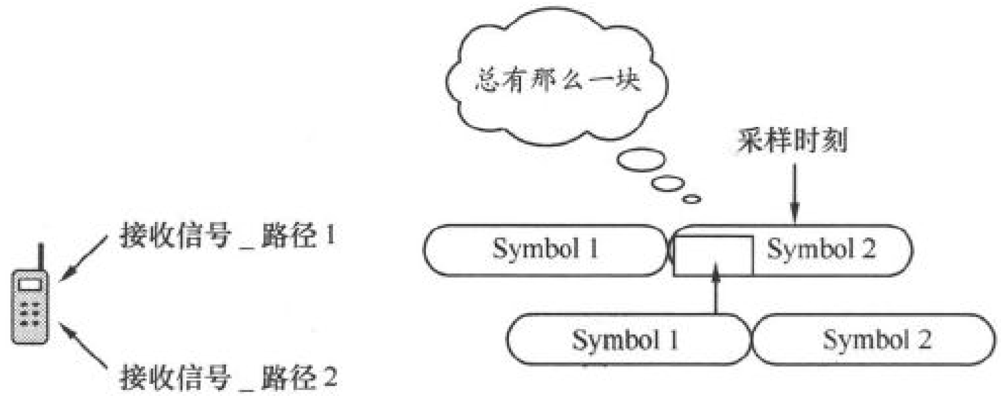


图7.10 [illegible]

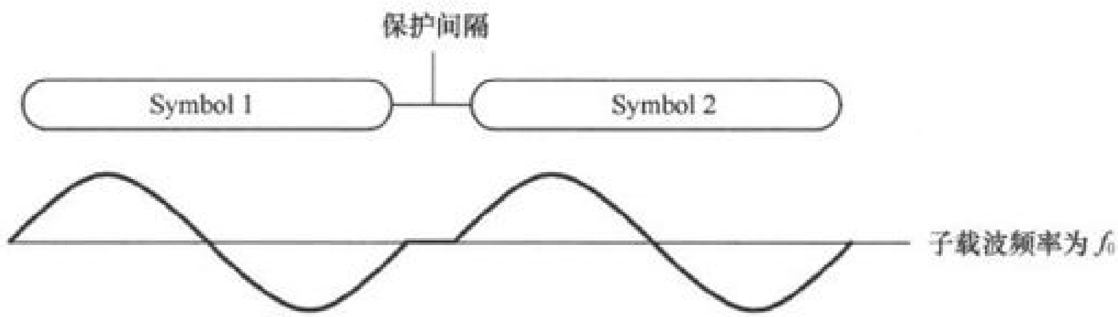
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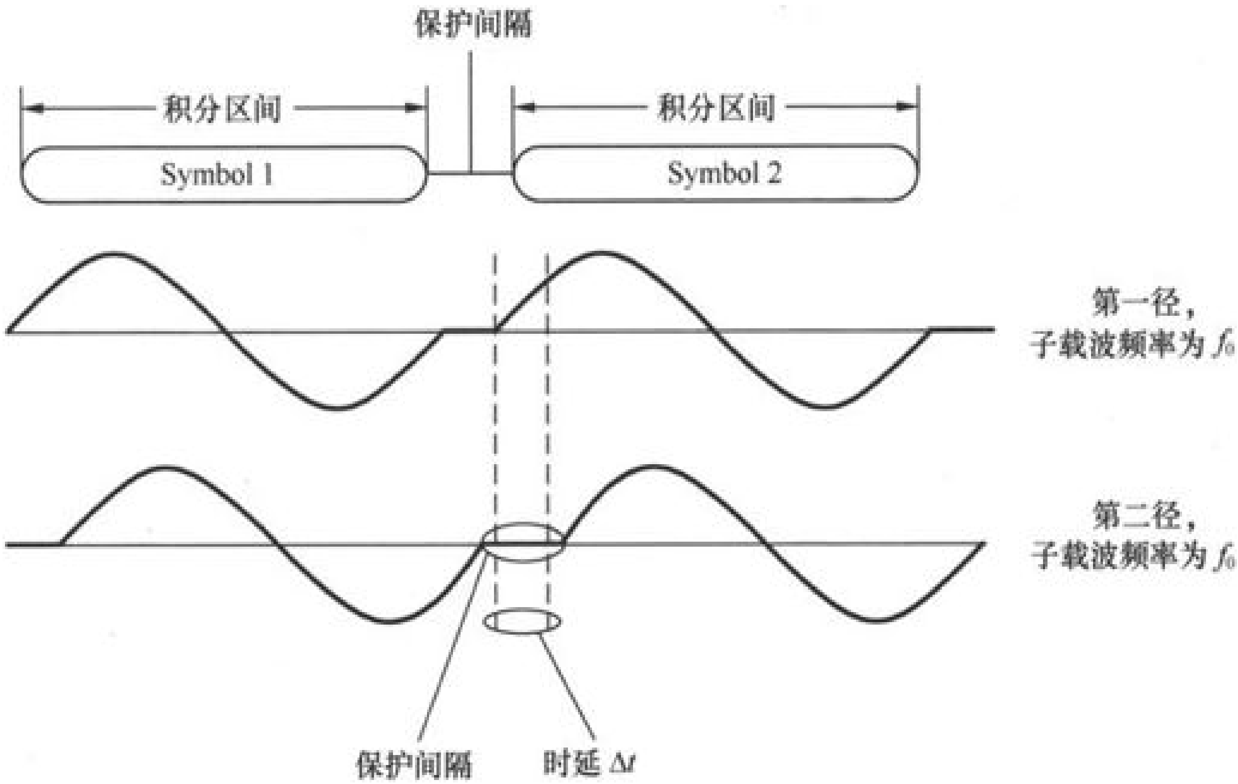
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[illegible]

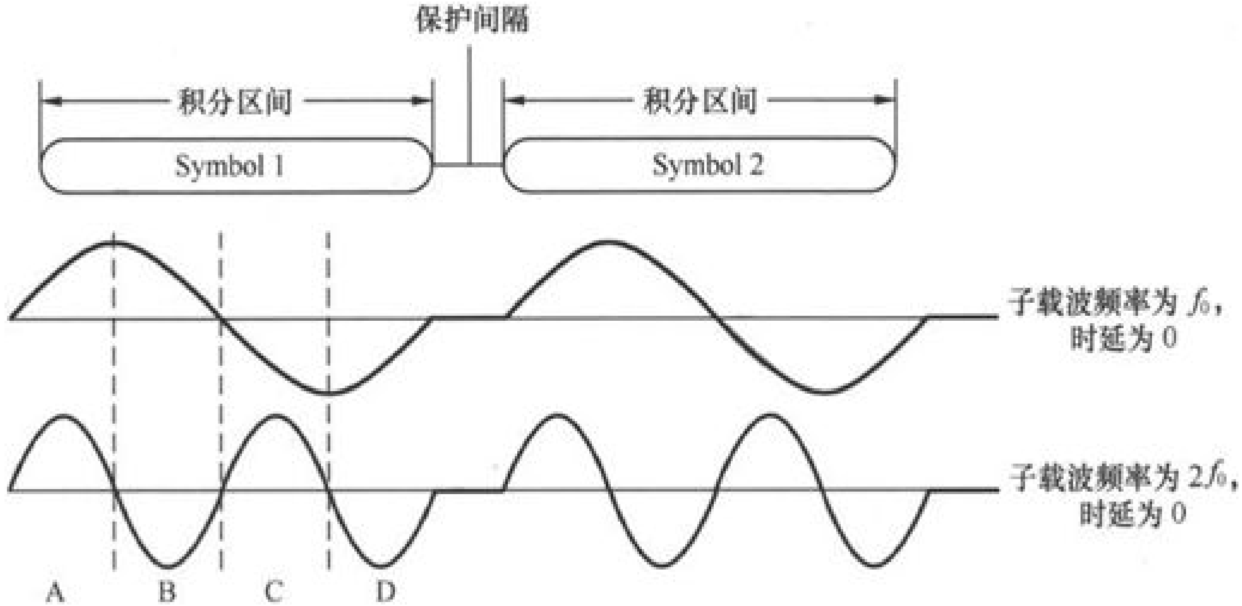
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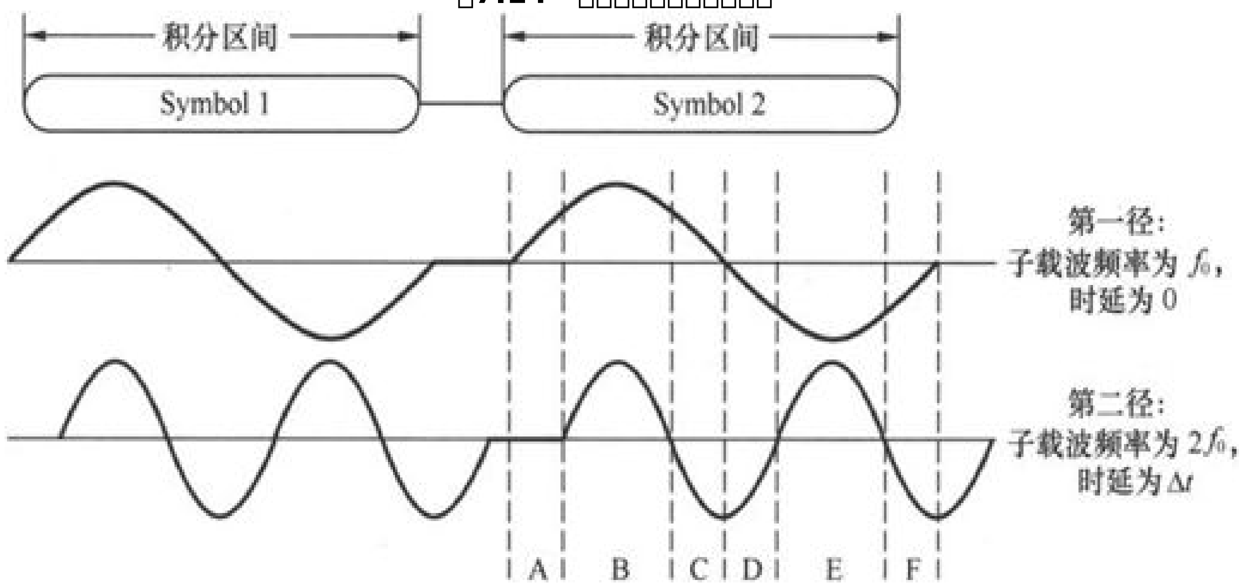
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□7.14 □□□□□□□□□□□



□7.15 □□□□□□□□□□

□□□7.15□□□□□□□□□□□□□□□□□□□□“□□□□”□□A□□□□□□□2□□□0□□□□□□□□□□□□0□□□B□E□□□□□□1□□□□□□□□□□□□□□□□□2□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□0□□□C□F□□□□□□1□□□□□□□□□□□□□□□□□2□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□0□□□□□□D□□□□D□□□□□□□□□□□□□□0□□□□□□□□□□□□□□□□□□□□□0□□□□□□□□□□□□□□□□□□□□□□□□ICI□Inter-Carrier Interference□□

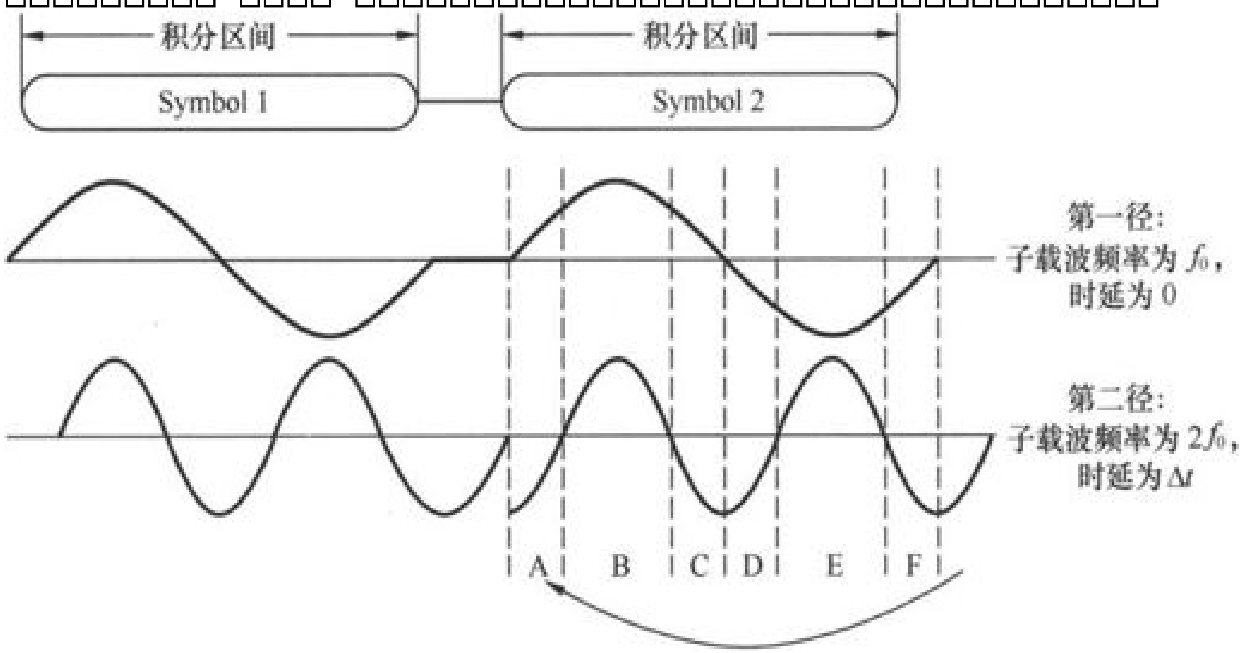
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□□□□□□□LTE□□□□□□□□OFDMA□□□□□□□OFDM□□□□□□PAPR□Peak to Average Power Ratio□□

□□LTE□□□□□□□□SC-FDMA□SC-FDMA□□□OFDMA□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□PAPR□

OFDM□□□□□□□□□□□□□□□□□□□□□□LTE□□□□□□□□□□□□□□□□□□□MIMO□□□

7.5 □□□□□□□——□□□□□MIMO

[illegible]

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	载波带宽	调制方式	每载波峰值速率	频谱效率（每载波峰值速率/载波带宽）
GPRS	200kHz	GMSK	171.2kbit/s	0.85bit/s/Hz
EDGE	200kHz	8PSK	473.6kbit/s	2.3bit/s/Hz
WCDMA R4	5MHz	QPSK	3.36Mbit/s	0.67bit/s/Hz
TD-SCDMA R4	1.6MHz	QPSK	1.4Mbit/s	1.25bit/s/Hz（TDD 方式，扣除 30%的上行时隙开销）
cdma2000 1x	1.25MHz	QPSK	864kbit/s	0.69bit/s/Hz
WCDMA HSDPA	5MHz	16QAM	14.4Mbit/s	2.9bit/s/Hz
TD-HSDPA	1.6MHz	16QAM	2.8Mbit/s	2.5bit/s/Hz（TDD 方式，扣除 30%的上行时隙开销）

续表

	载波带宽	调制方式	每载波峰值速率	频谱效率（每载波峰值速率/载波带宽）
cdma2000 EV-DO Rev. A	1.25MHz	16QAM	3.1Mbit/s	2.5bit/s/Hz
WCDMA HSPA+	5MHz	64QAM	21Mbit/s	4bit/s/Hz
TD HSPA+	1.6MHz	64QAM	4.2Mbit/s	3.8bit/s/Hz（TDD 方式，扣除 30%的上行时隙开销）
cdma2000EV-DO Rev. B	1.25 × 3MHz	64QAM	14.7Mbit/s	3.9bit/s/Hz

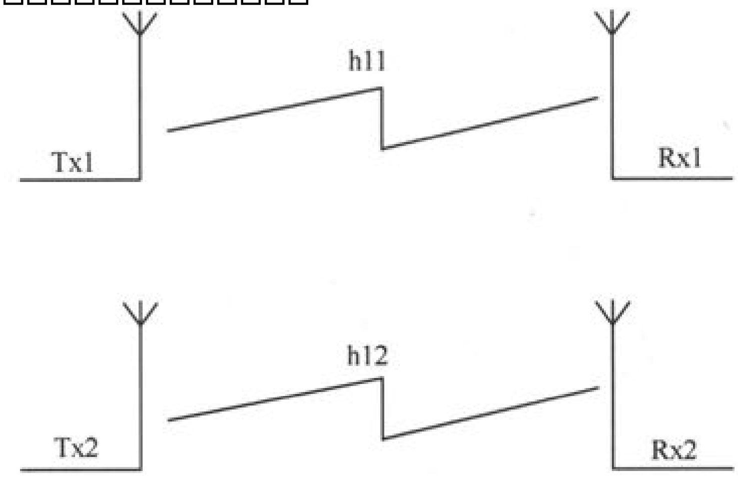
□□□□□□30kHz□□□□□□□□□□BLAST□□□□□□□□□□0.5□1Mbit/s□□□□□□□□□□□50kbit/s□BLAST□□□□□□□□□□□□□□□□□□□□□□□□

□BLAST□□WCDMA□□□□Walsh□□□Walsh□□□□□□□□□□□□□□□□□□N□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

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[illegible]

[illegible]“[illegible]”[illegible]CDMA[illegible]3G[illegible]MIMO[illegible]



[illegible]7.17 2×2[illegible]

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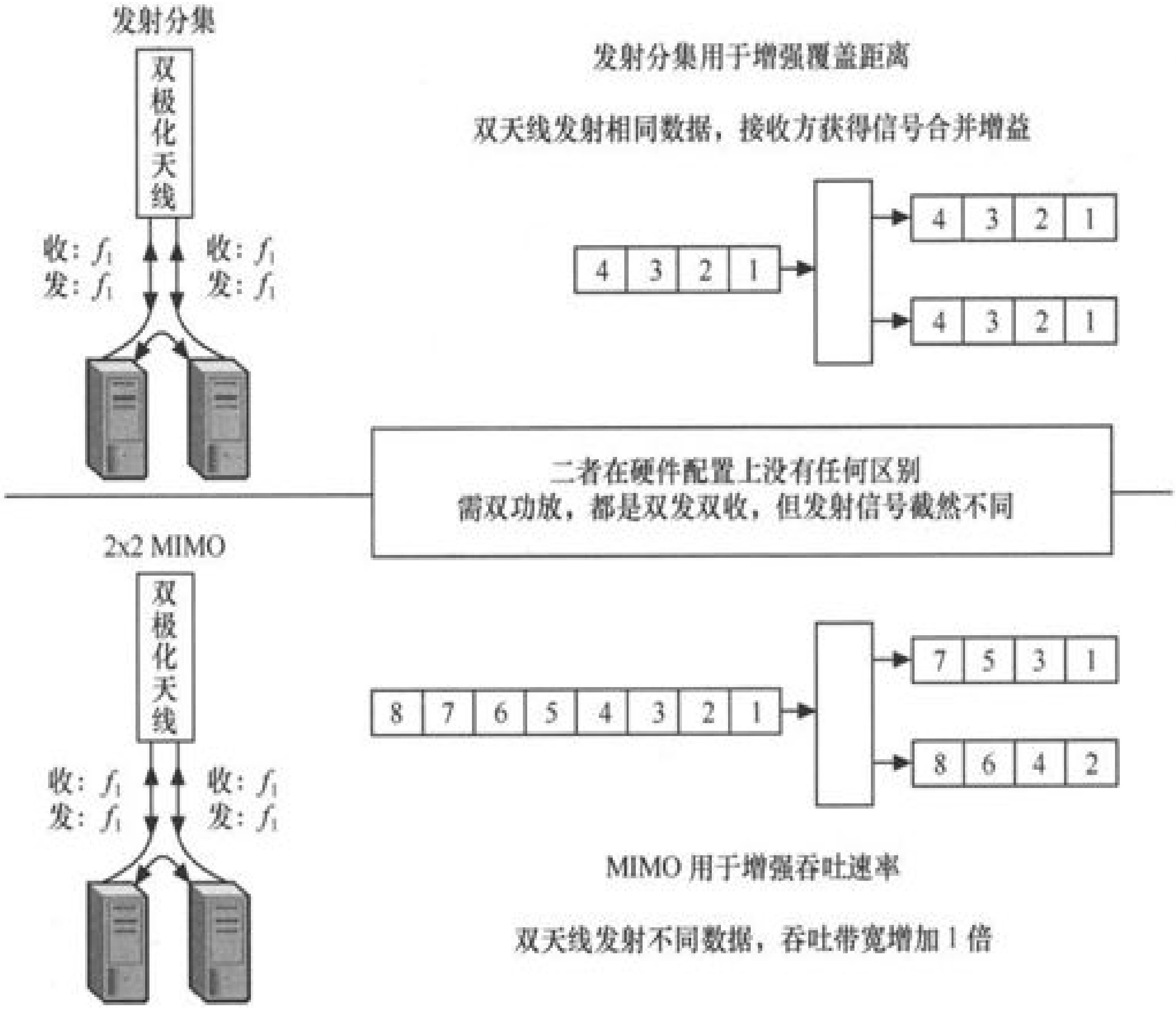
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M×N□MIMO□□□□□□□□□□□□□□□□□□□□□□□□□M×N□□□□□□□□□□□□□□□□

□□□NTT DoCoMo□□□2003□5□□□□□□□□□□OFDM□□□□100MHz□□□□□□100Mbit/s□□□□□□□□□□□□MIMO□□□□□□□□□□“□□□□”□□□□□□□□□2005□5□□2005□12□□2006□12□□□□□□□□□□1Gbit/s□□□4×4□□□□2.5Gbit/s□□□6×6□□□□5Gbit/s□□□12×12□□□□□□□□□□OFDM/MIMO□□□□□□□□□□□□□OFDM/MIMO□□□□□□□□□□□□□□□□□□□□□□□□□□□□□OFDM/MIMO□□□□□□□□



□7.18 □□□□MIMO□□□□□

OFDM[illegible]MIMO[illegible]LTE[illegible]LTE[illegible]LTE[illegible]LTE[illegible]

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[illegible]3[illegible]

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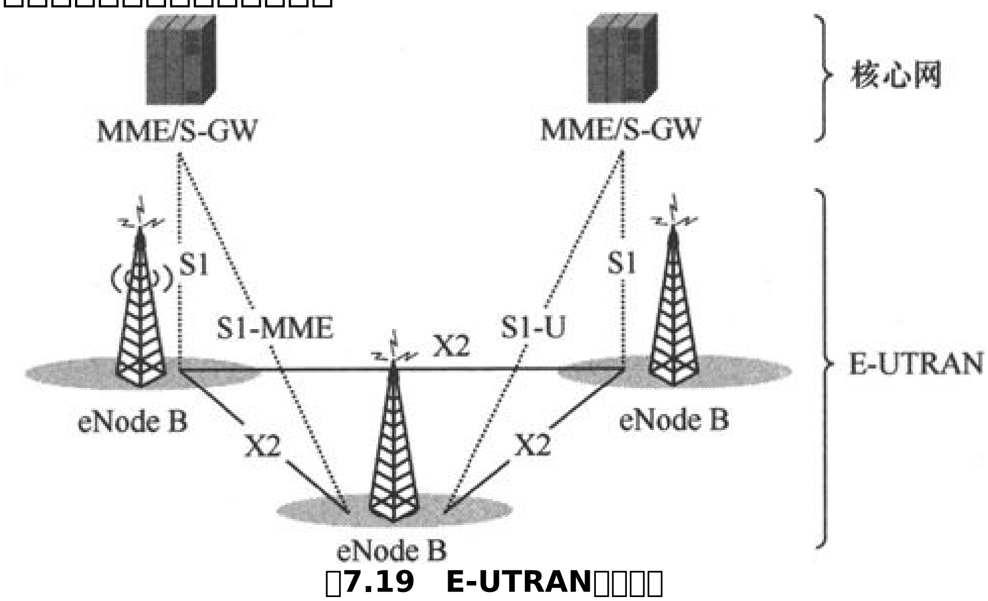
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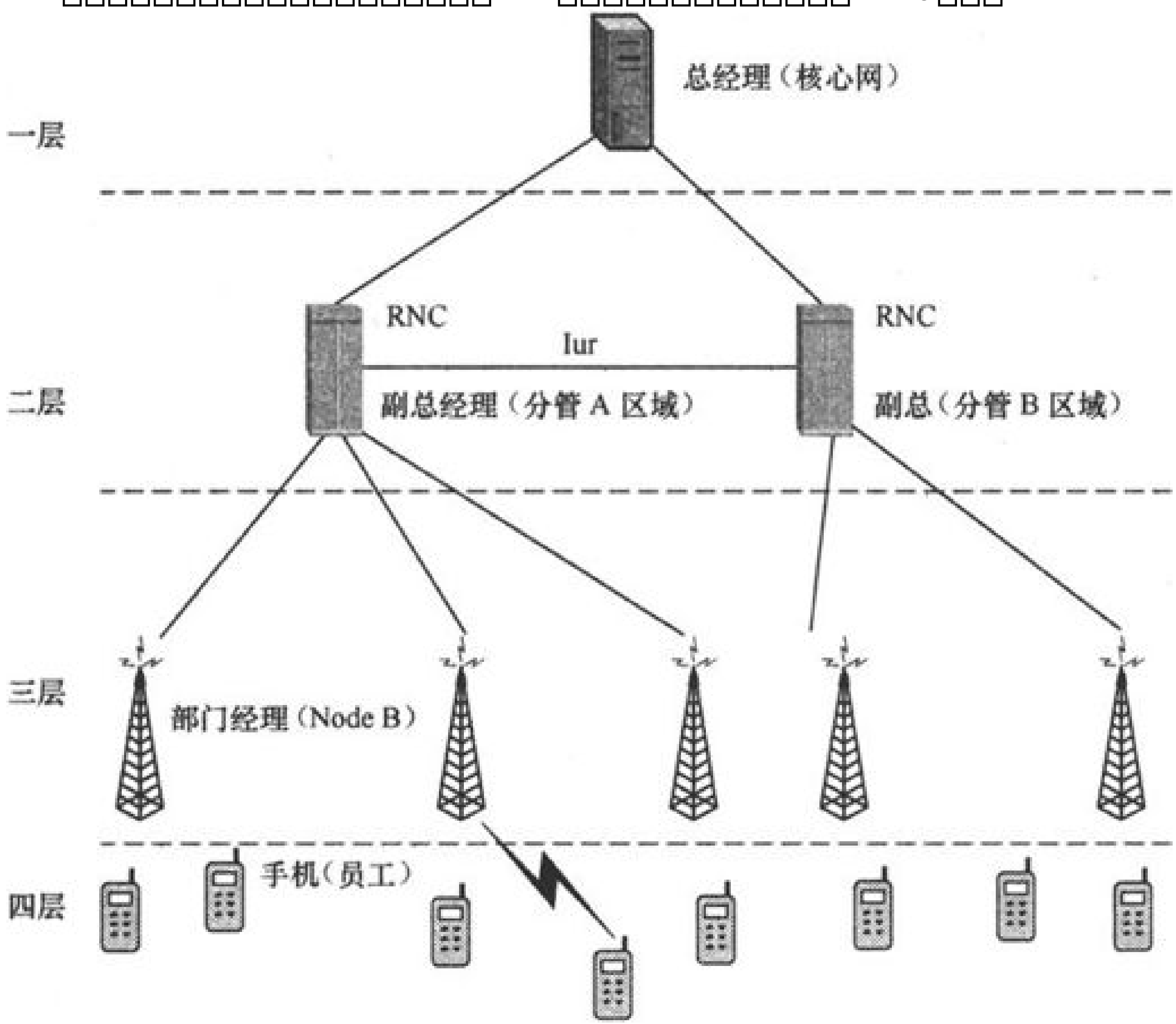
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S1-U[illegible]WCDMA[illegible]Iu-CS[illegible]Iu-PS[illegible]MME[illegible]MME[illegible]Mobility Management Entity[illegible]

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□□eNode B□□□□□□□□□□□□□□□□

□□S1□□□□□eNode B□□□□□□□□□□□□□□X2□□□□□□□□□□□□□□□□□□□GSM□WCDMA□□cdma2000□TD-SCDMA□□□□□□□□□□□□□□□□□□□□□LTE□□□RNC□□□□□□RNC□□□□□eNode B□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□RNC□□□□□□□□□□□RNC□□□□□□□eNode B□X2□□□RNC□□□□□□□□□□□□□□□□□□□□□□□□□□□□X2□□□□□□□□□□WCDMA□TD-SCDMA□□Iur□□□□□cdma2000□□A3/A7□□□

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□7.20 □□□3G□□□□

3G□□RNC□□□□□
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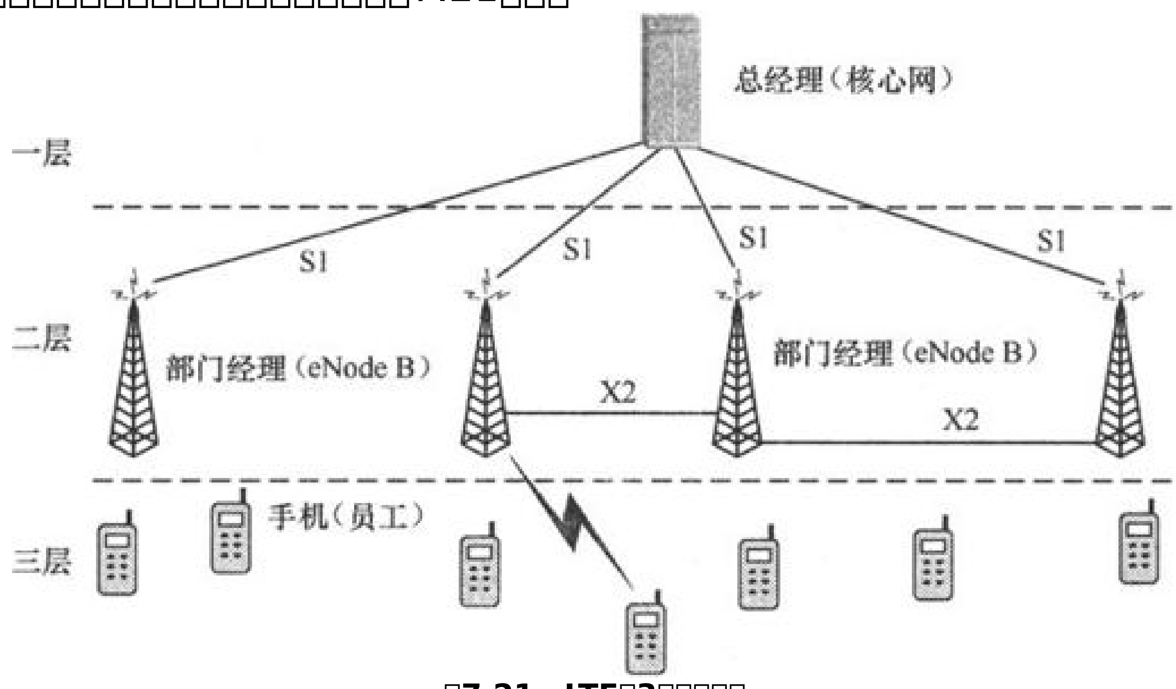
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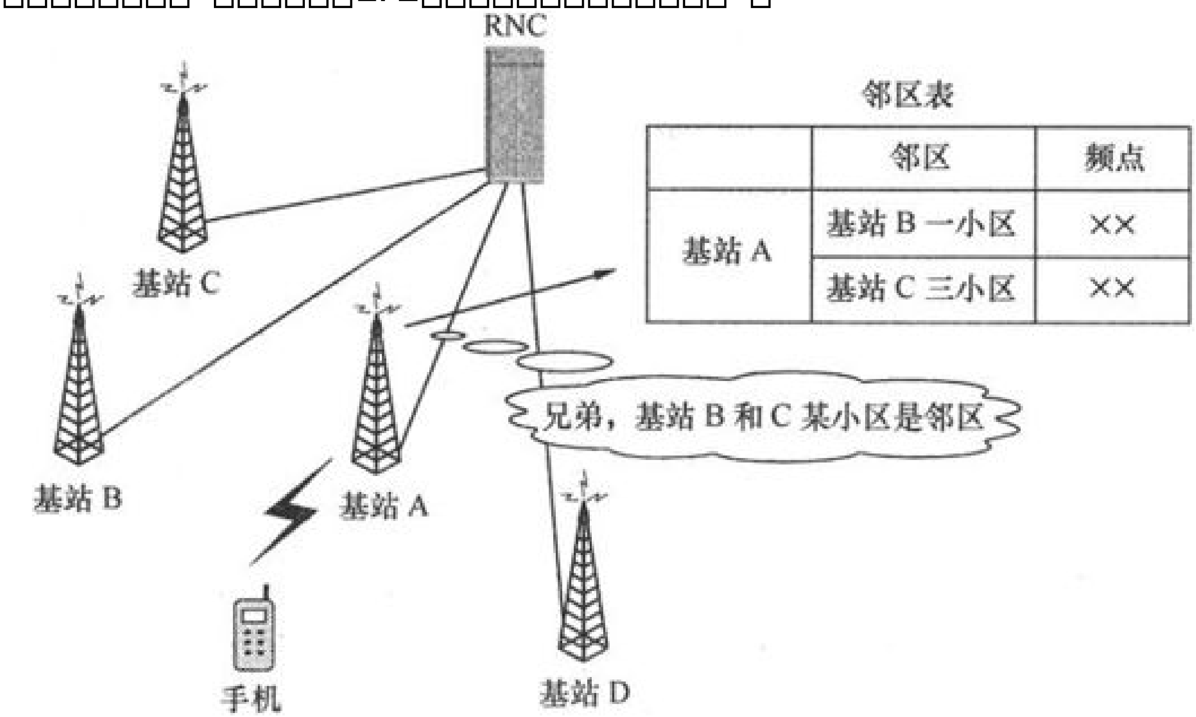
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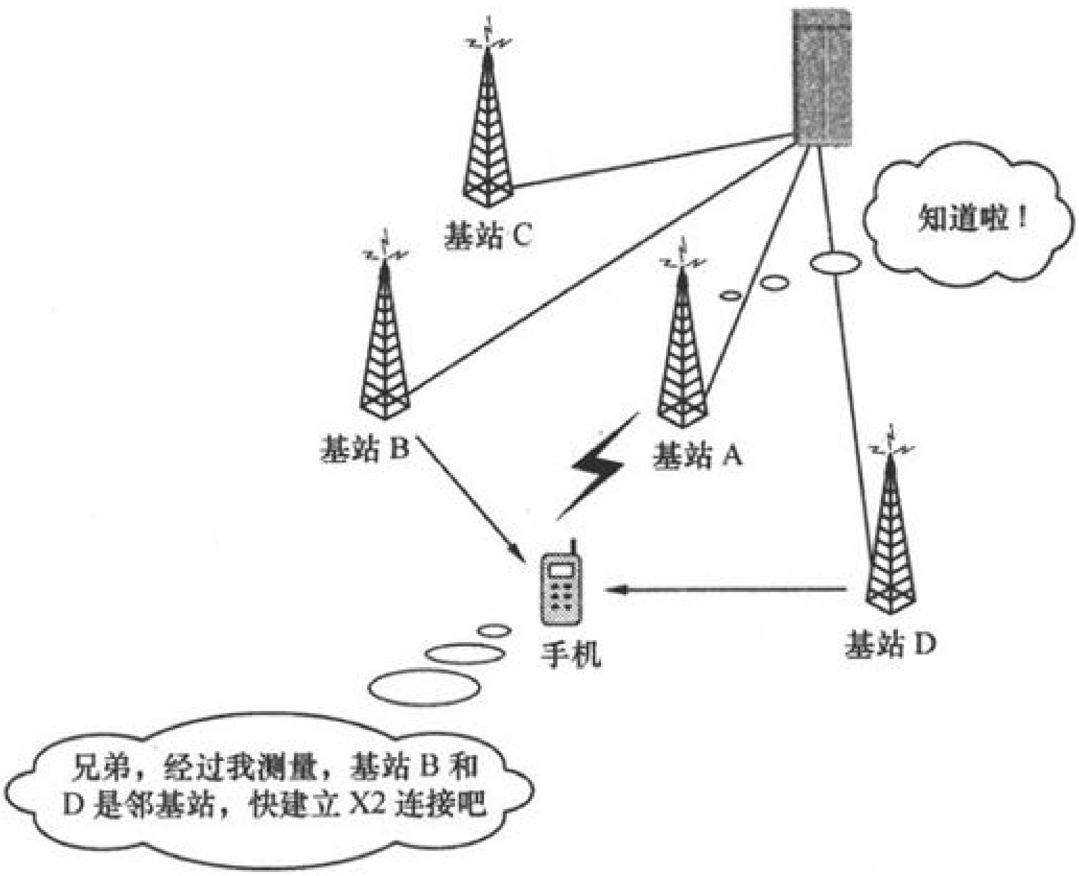
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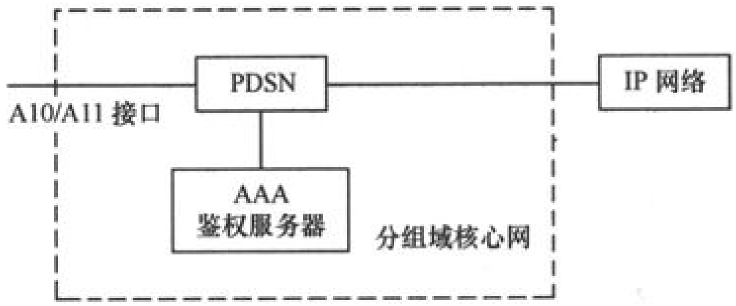


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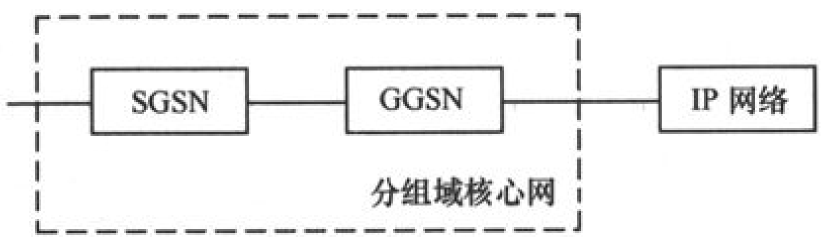
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AAA[illegible]

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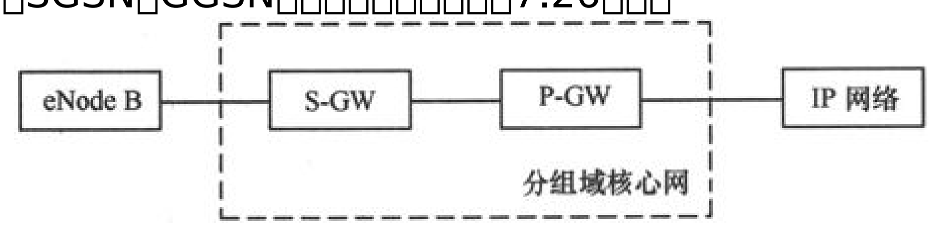


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3[illegible]LTE[illegible]EPC[illegible]

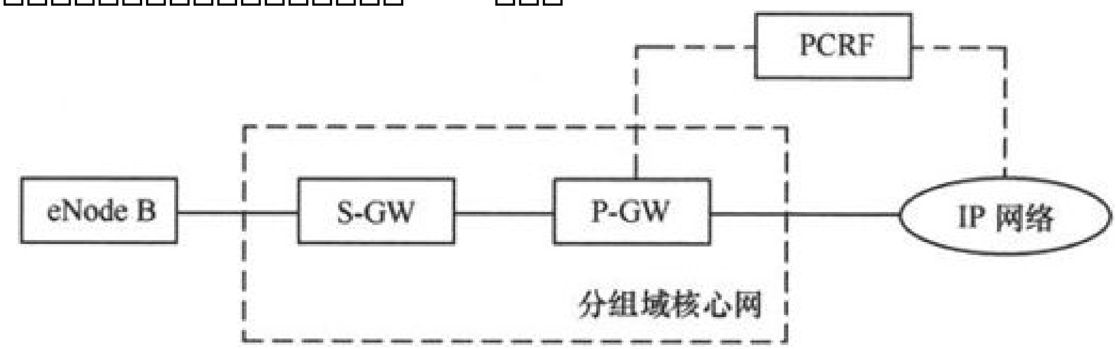
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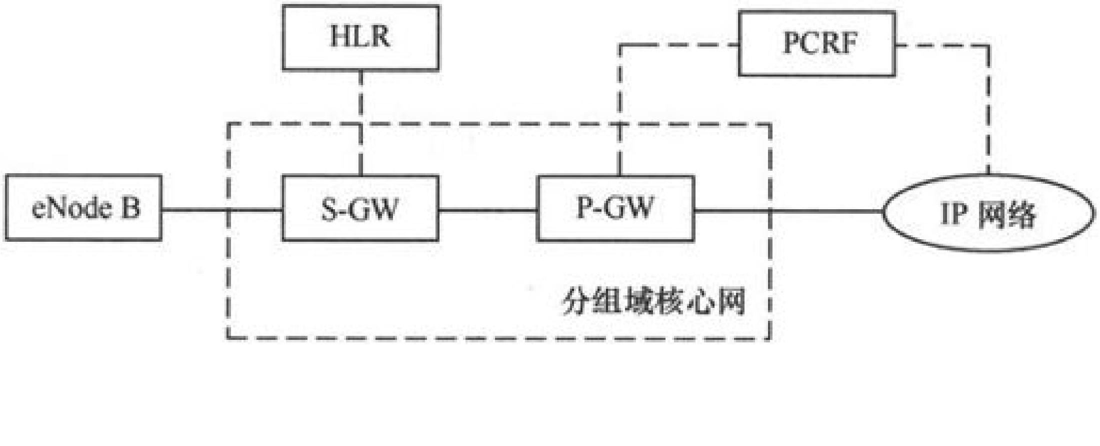
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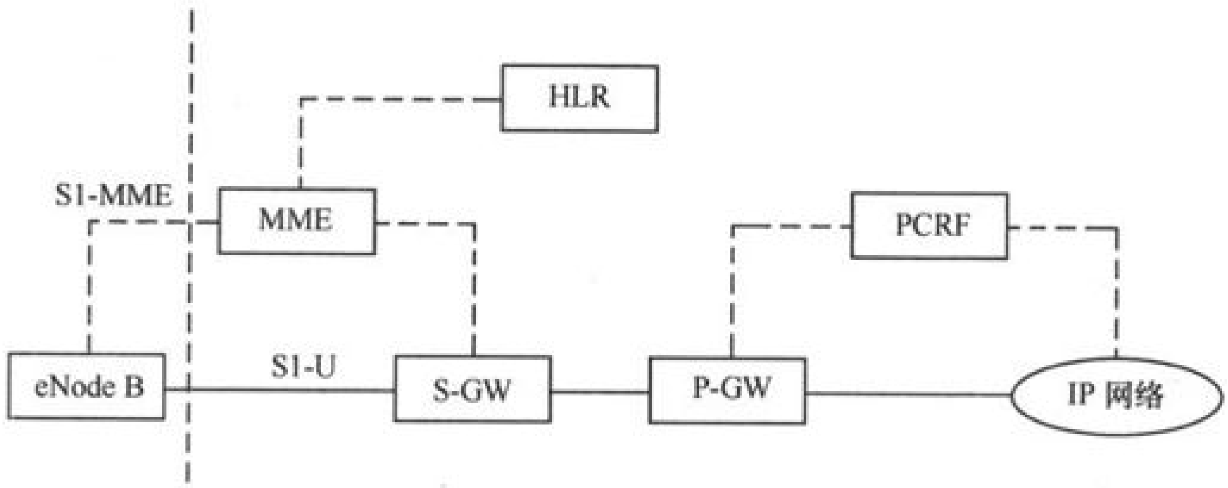
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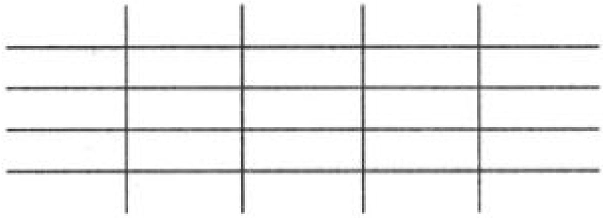
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[illegible]7.30[illegible]



□7.30　□□□□□

1□GSM□LTE□□□□□

GSM□□□GSM□□□890□915MHz□□□25MHz□□200kHz□□□□□□□□□□□□75□□□□□□□□□□75□□□□□□□□□□□□GSM□□□TDMA□□□8□□□□TDMA□□4.615ms□□□□□□□□□□□□□□0.577ms□□□□□200kHz□□□□0.577ms□□□□□□□□□□7.31□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□



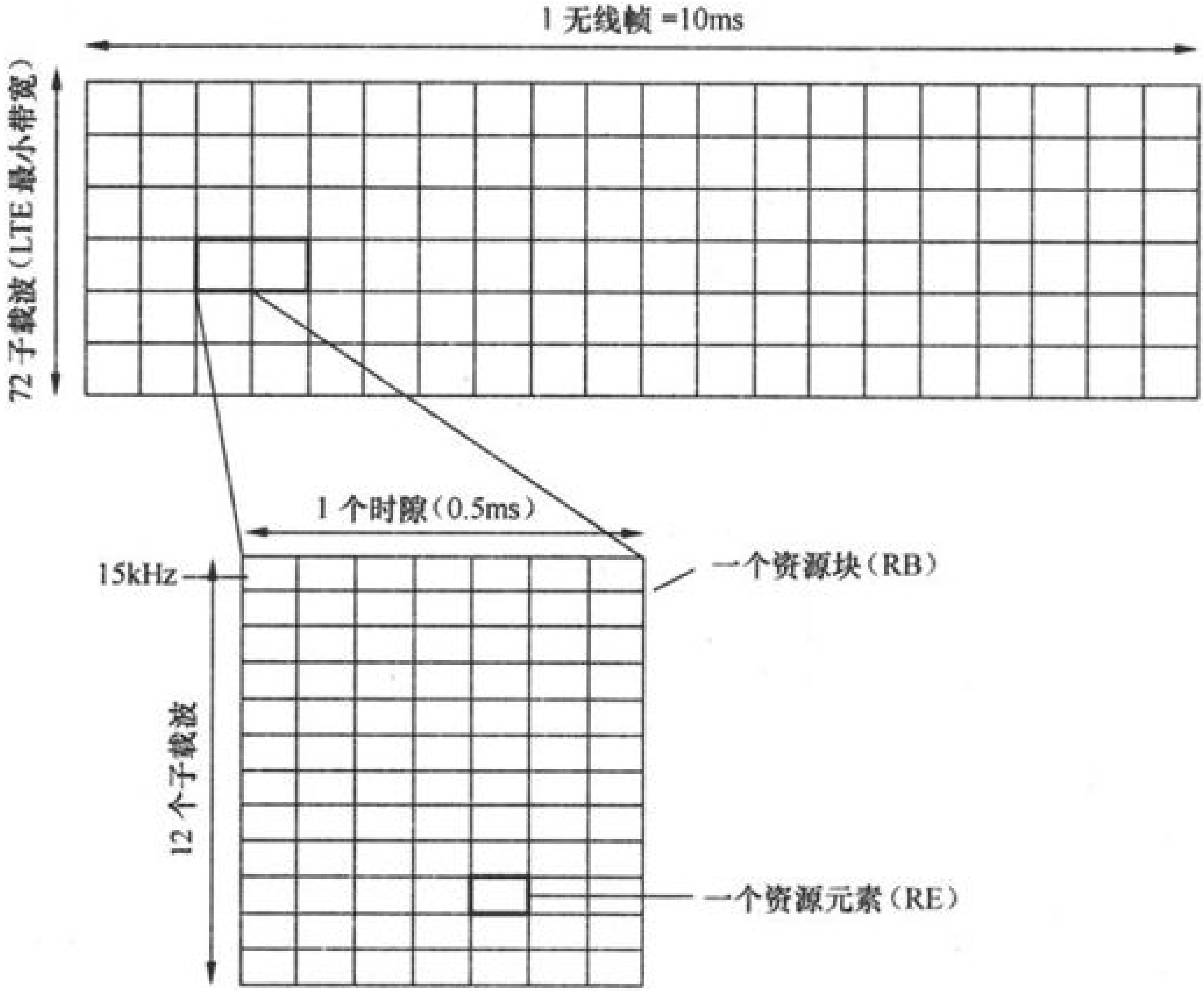
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□7.32 LTE□□□□□□□□□□□□□□□

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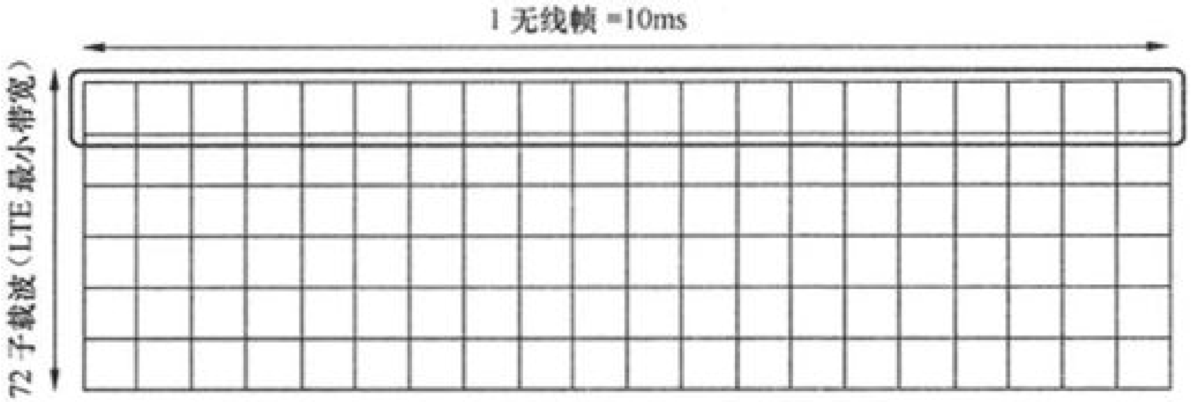
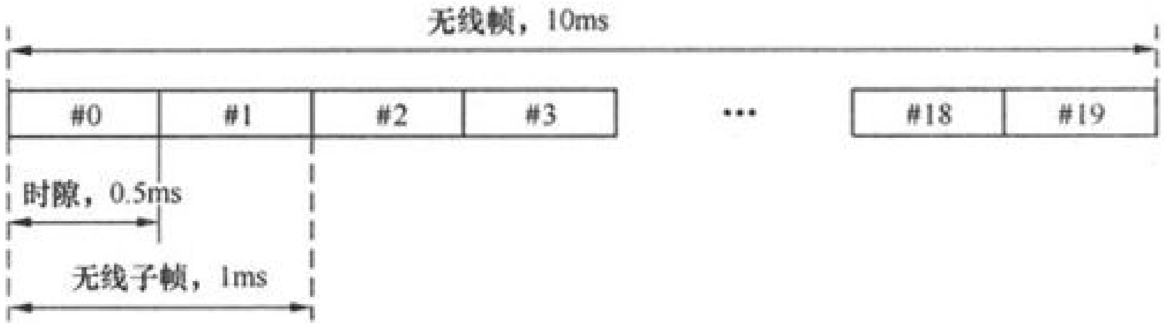
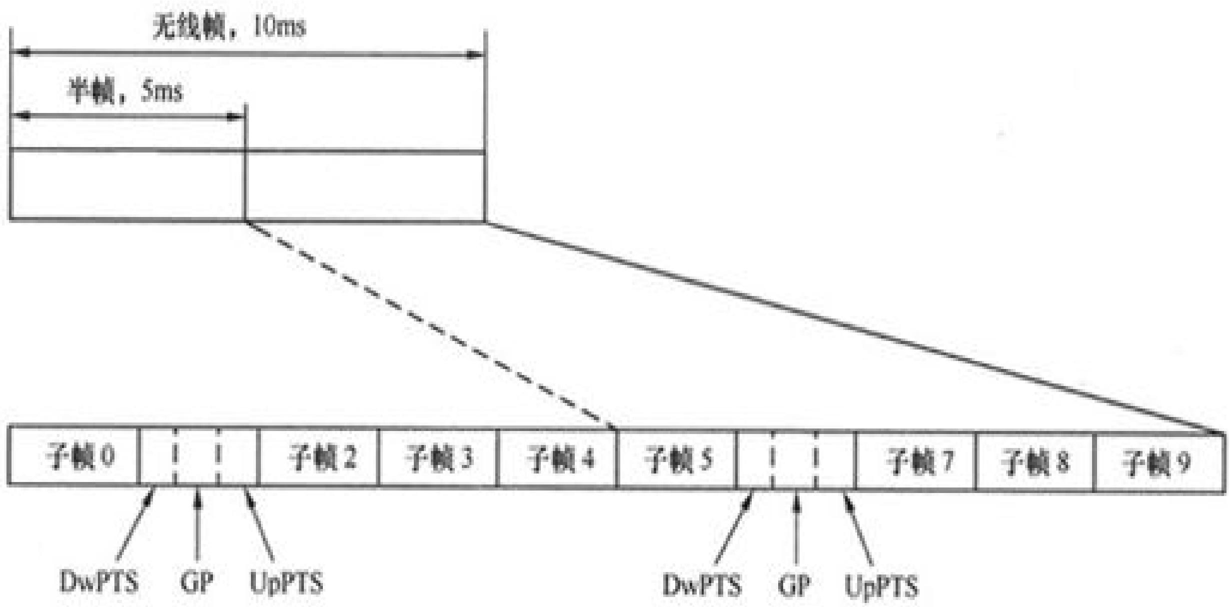


图 7.33　LTE 的无线帧



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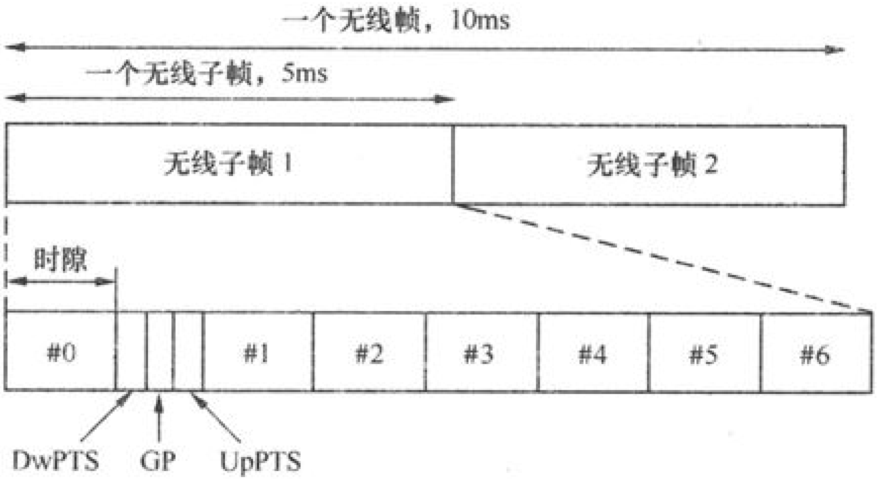


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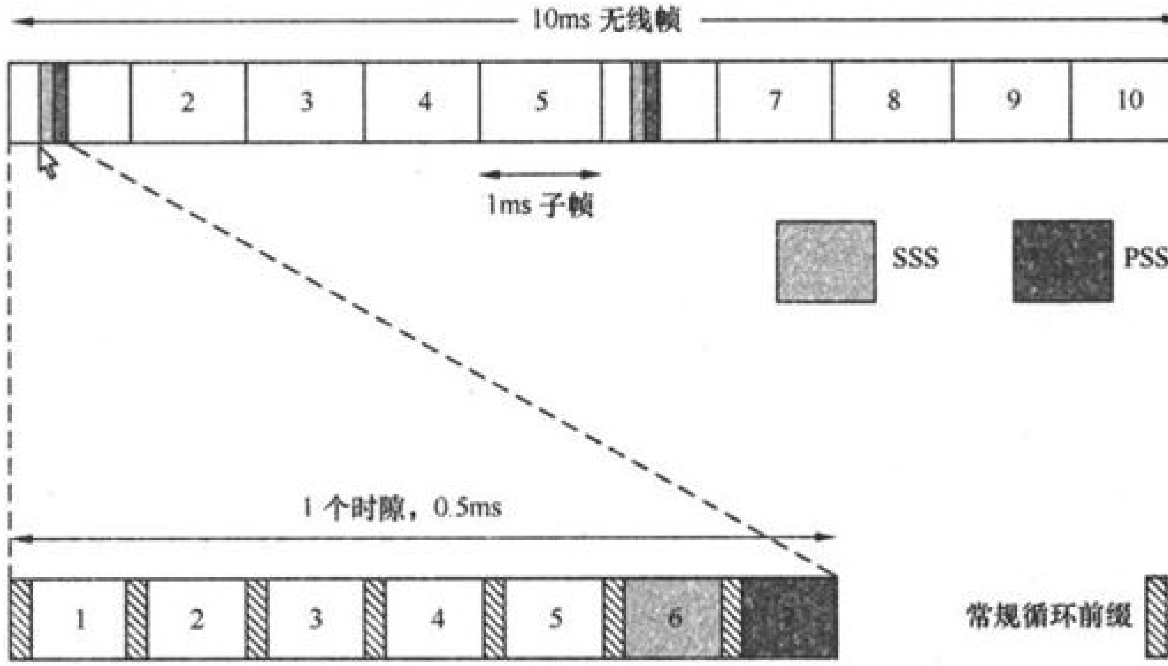
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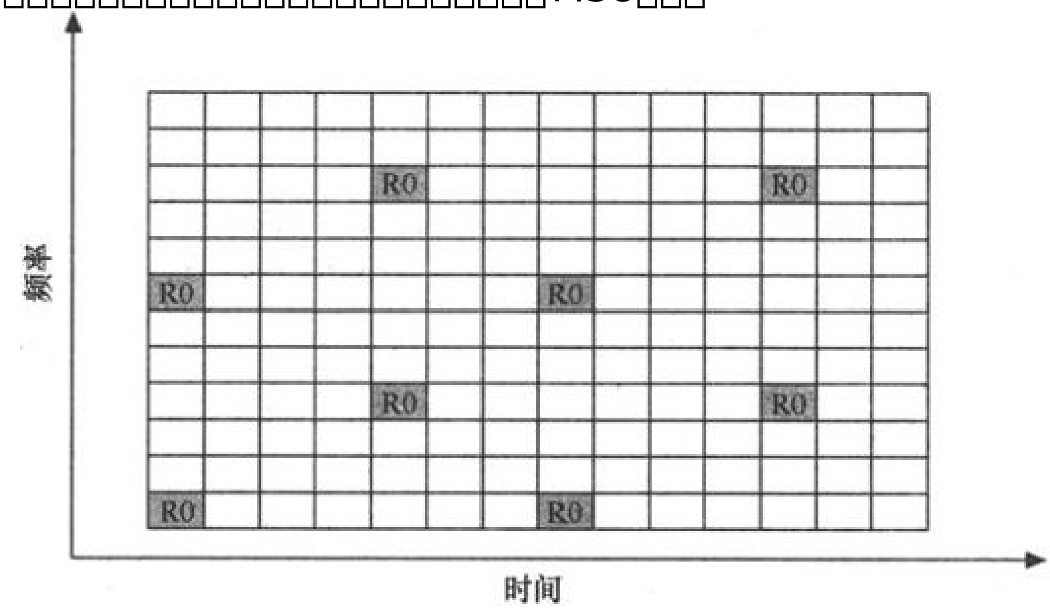
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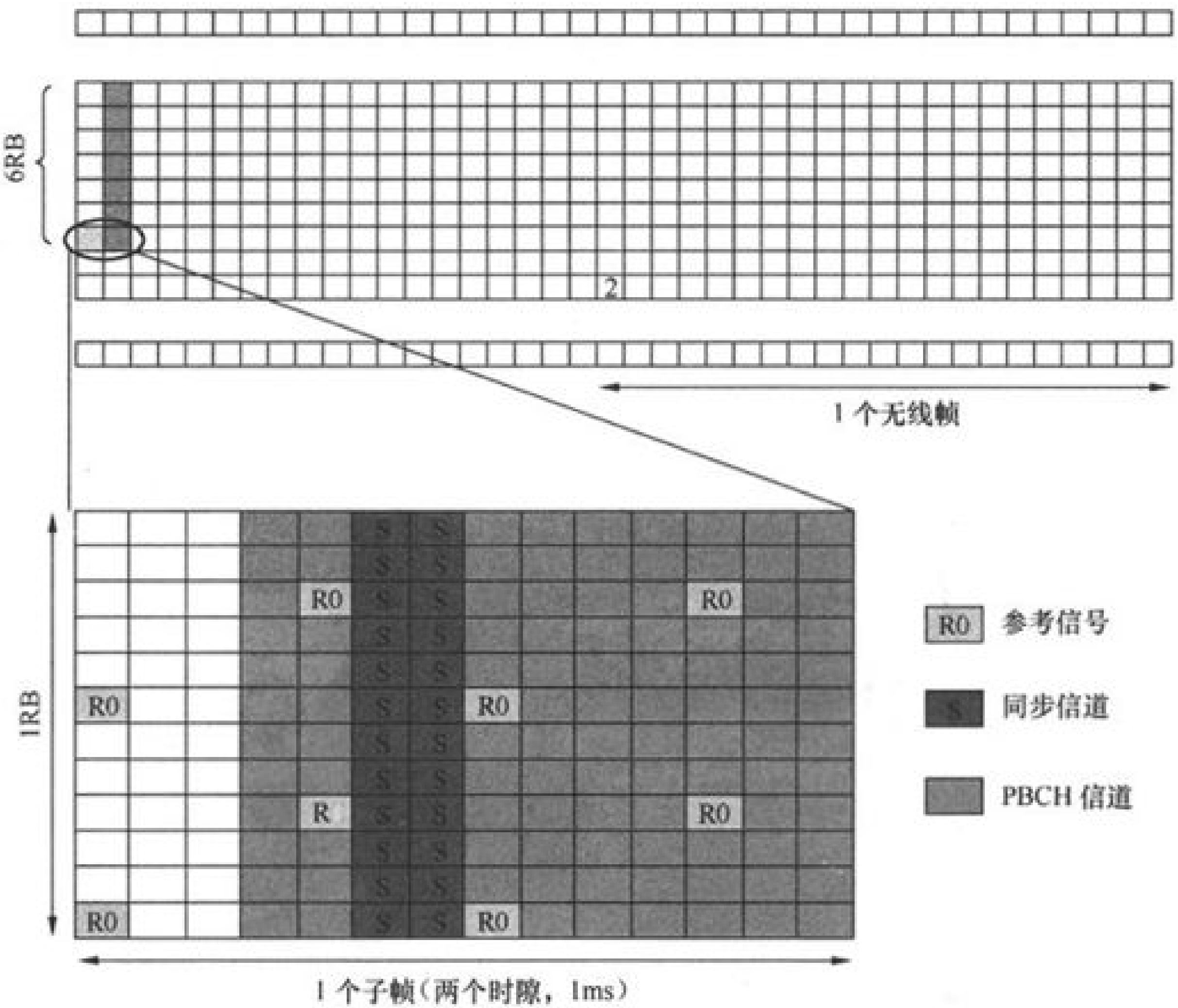
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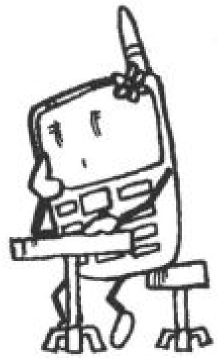
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Chapter 8
□□4G——LTE-Advanced



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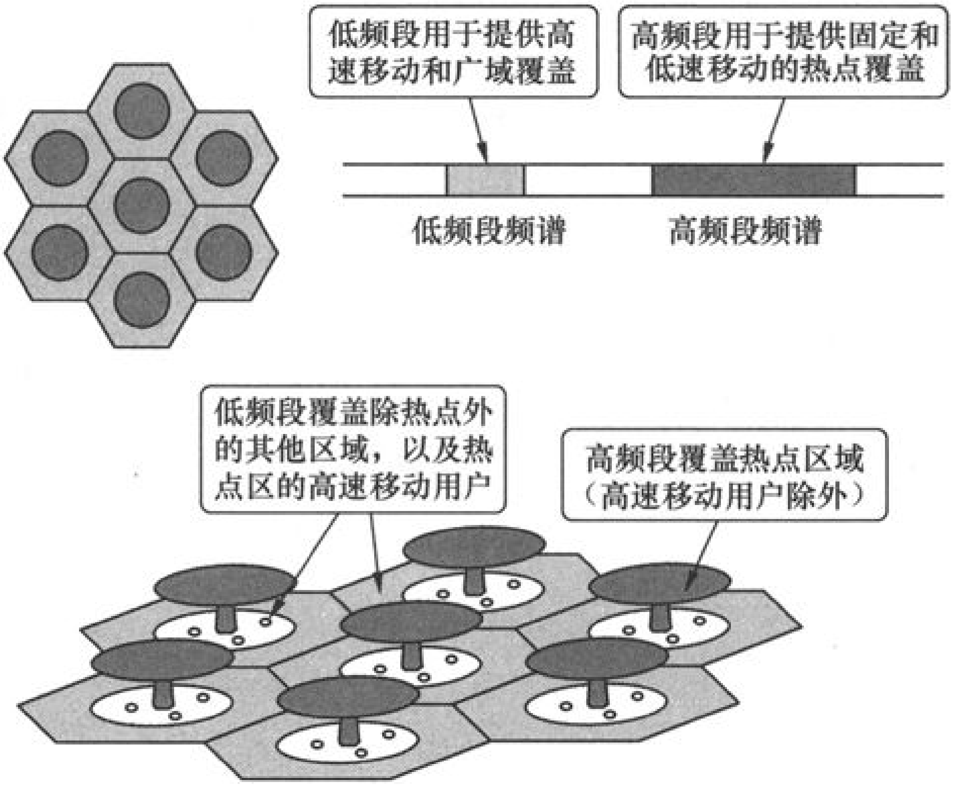
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LTE-Advanced □□□□□□□□□□□□□□ 30bit/s/Hz □□□□□□□□ 15bit/s/Hz□□□□□□□□□□□□8×8□□□□□□□□□□4×4□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

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8.2 □□□□□□——LTE-Advanced□□□□

LTE□3G□□□□□□“□□”□□□“□□”□□□□□□□□□□□□□□□□OFDMA□MIMO□□□□□□□□□□□□□20□□□□□□□□□□□□LTE-Advanced□□□□□□□□□□□□□□□□□

[illegible]LTE-Advanced[illegible]LTE[illegible]OFDM[illegible]MIMO[illegible]LTE[illegible]4G[illegible]IMT-Advanced[illegible]LTE[illegible]LTE[illegible]

[illegible]3GPP[illegible]LTE-Advanced[illegible]LTE[illegible]LTE[illegible]LTE[illegible]LTE-Advanced[illegible]LTE-Advanced[illegible]LTE[illegible]GSM[illegible]WCDMA[illegible]WCDMA[illegible]LTE[illegible]3GPP[illegible]LTE[illegible]LTE[illegible]4G[illegible]LTE[illegible]4G[illegible]

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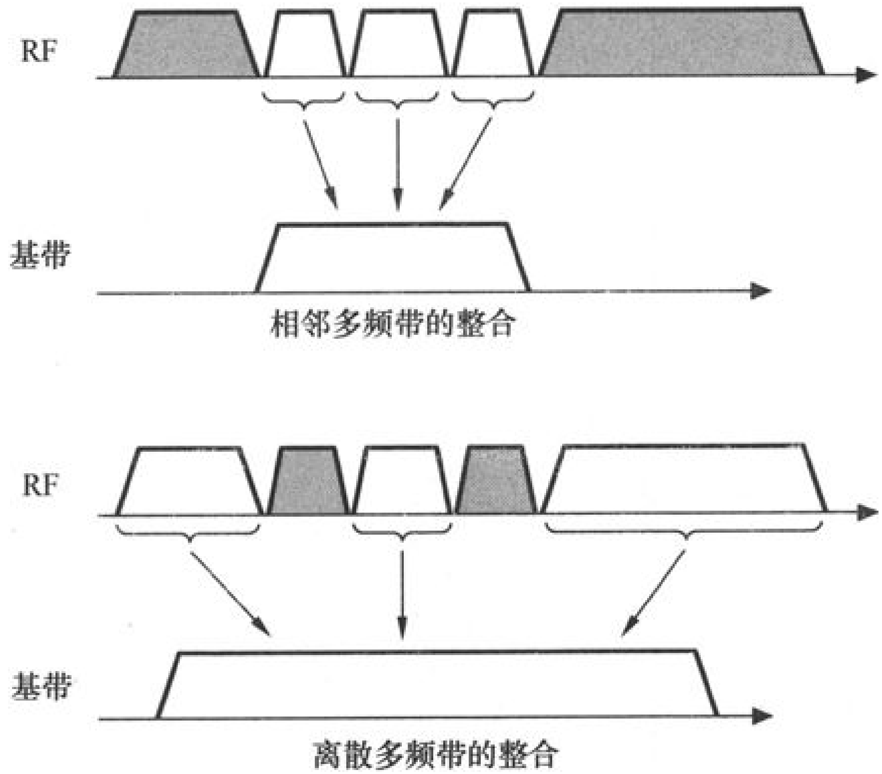
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[illegible]LTE-Advanced[illegible]1[illegible]LTE-Advanced[illegible]

[illegible]LTE-Advanced[illegible]8.2[illegible]

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[illegible]LTE[illegible]LTE[illegible]20MHz[illegible]20MHz[illegible]LTE-Advanced[illegible]



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[illegible]LTE-Advanced[illegible]LTE[illegible]LTE[illegible]LTE-Advanced[illegible]

8.2.2 [illegible]——CoMP

[illegible]KPI[illegible]

[illegible]LTE[illegible]

[illegible]LTE-Advanced[illegible]CoMP[illegible]Coordinated Multi-Point[illegible]

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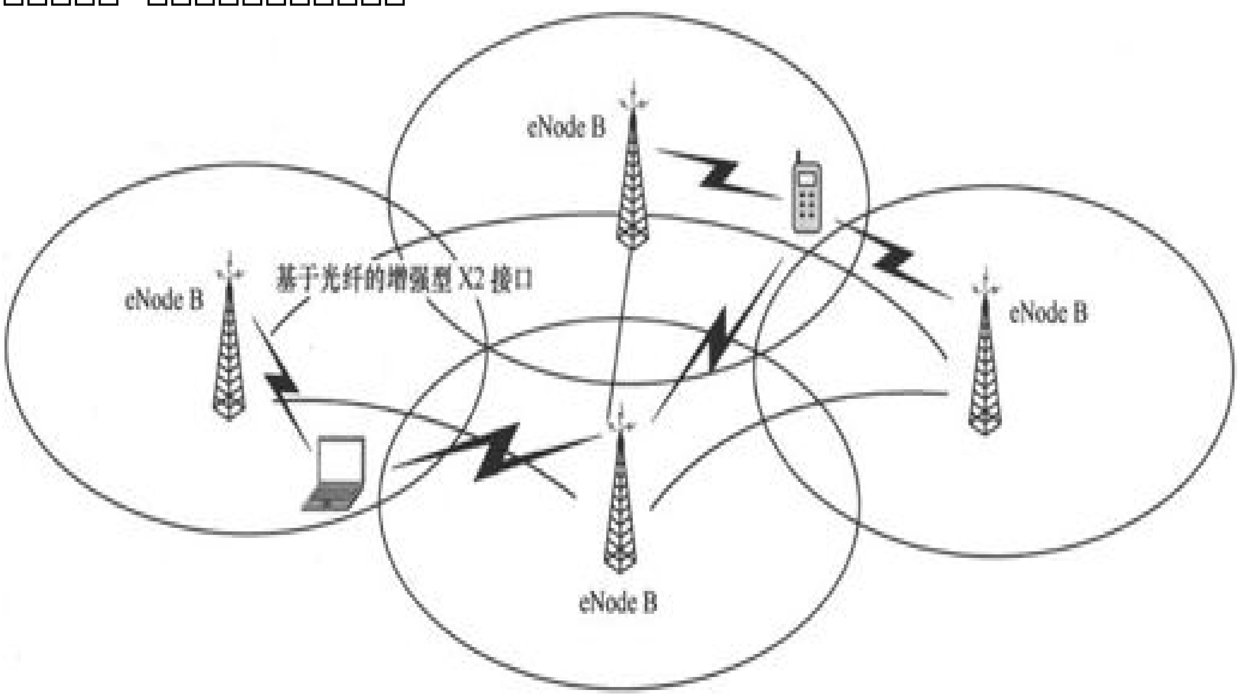
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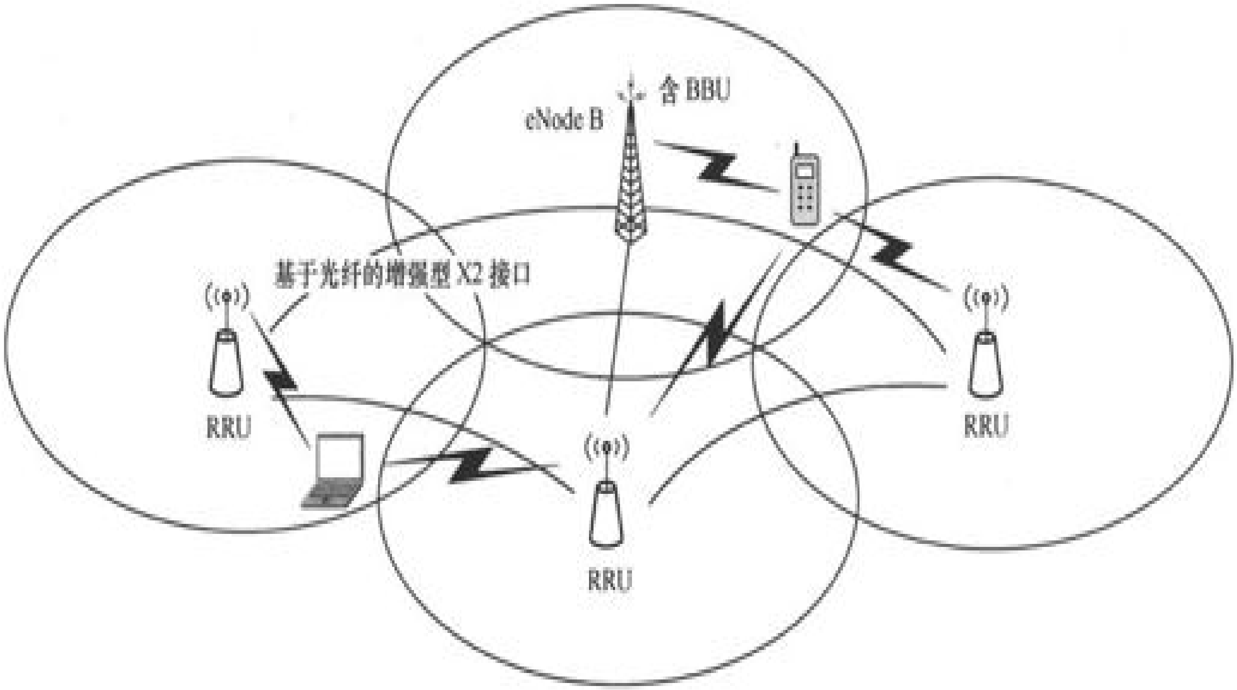
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[illegible]**8.4** [illegible]

[illegible]RoF[illegible]RRU[illegible]“[illegible]”[illegible]eNode B[illegible]RRU[illegible]

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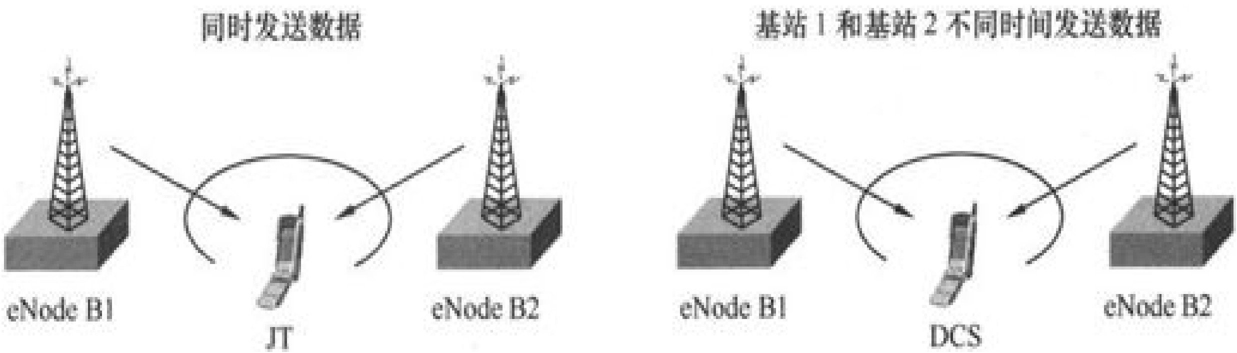
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①[illegible]PDSCH[illegible]8.5[illegible]

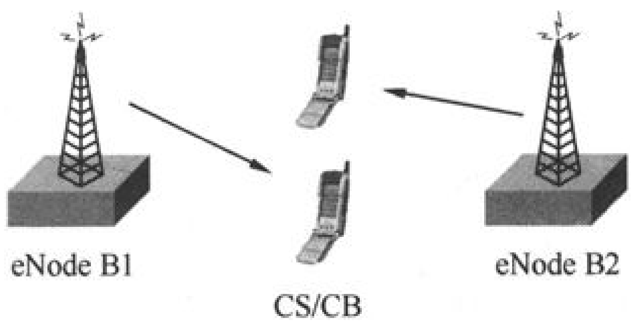
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□8.5 □□□□□□□□□

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□□□□□□□□□□□CS/CB, Coordinated Scheduling/Coordinated Beamforming□□□□□□□□□□□□□□□□□□□□CoMP□□8.6□□□□□□□□□□□□□



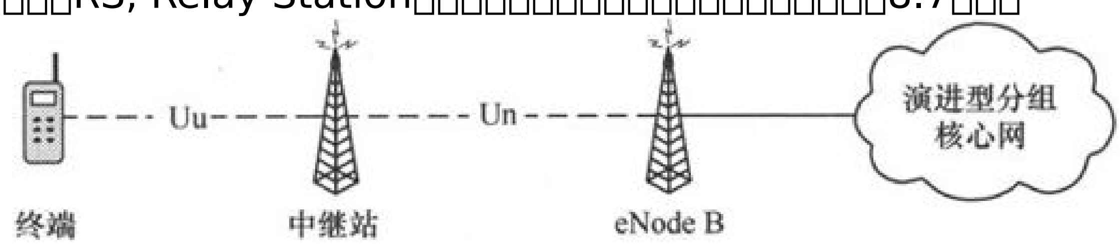
□8.6 □□□□□□□□□

□□□BBU-RRU□□□□□□RRU□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□RRU□□□□□□□□□□□□□

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8.2.3 4G□□□□□□——□□□Relay□

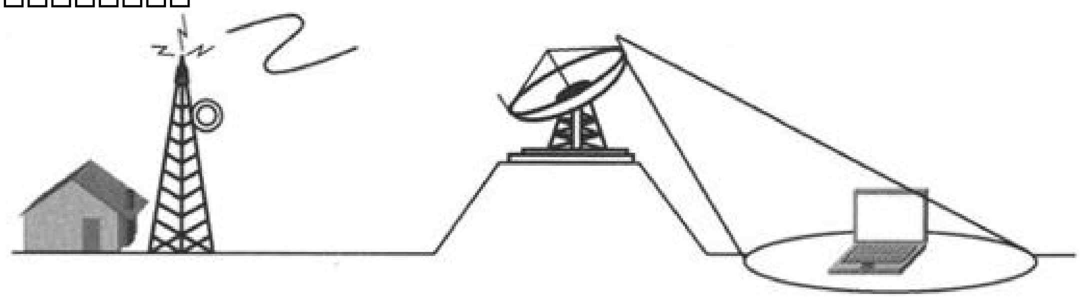
□□□RS, Relay Station□□□□□□□□□□□□□□□□□□□□□8.7□□□



□8.7 □□

[illegible]8.7[illegible]Un[illegible]eNode B[illegible]Uu[illegible]eNode B[illegible]8.7[illegible]Un[illegible]eNode B[illegible]RRU[illegible]

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8.2.4 [illegible]——femto

[illegible]Wi-Fi[illegible]3GPP[illegible]Wi-Fi[illegible]Wi-Fi[illegible]LTE[illegible]

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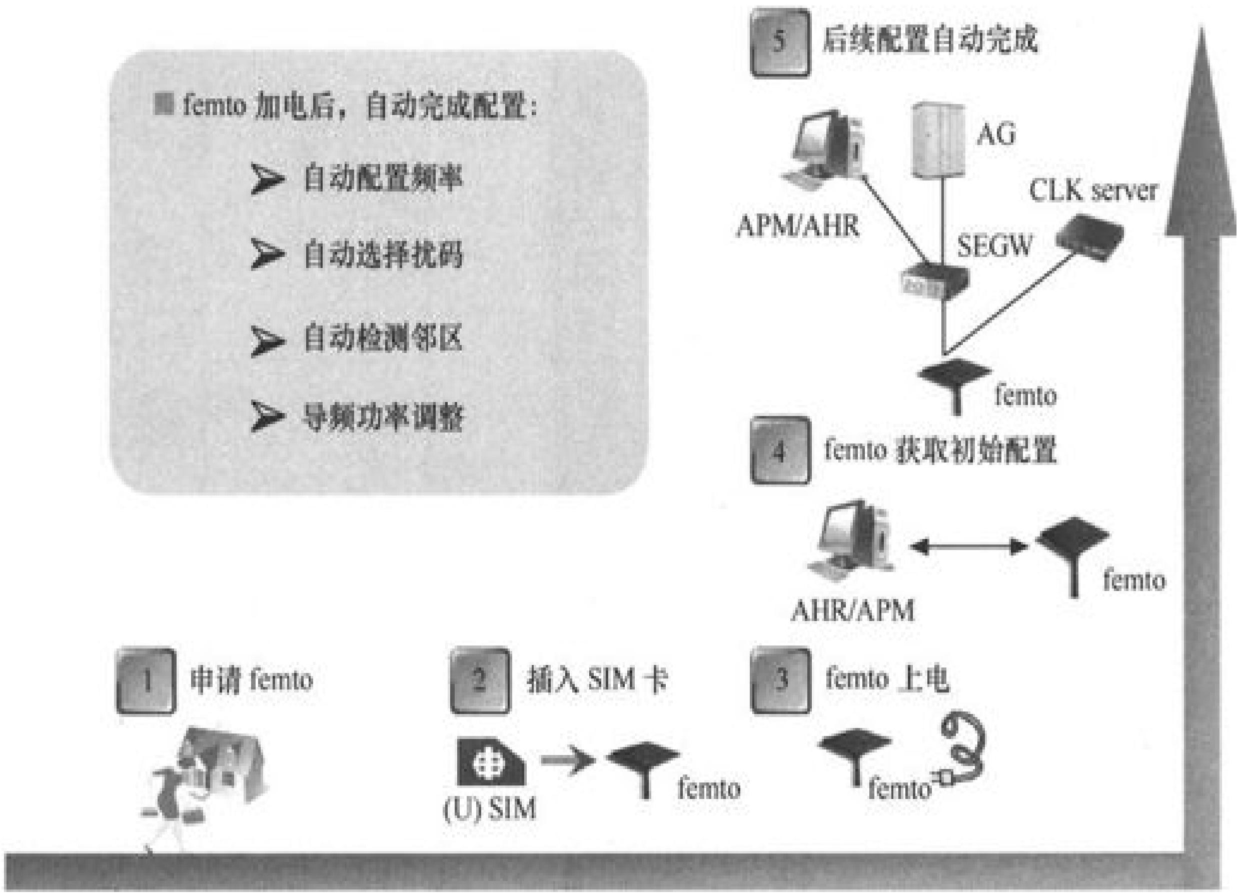


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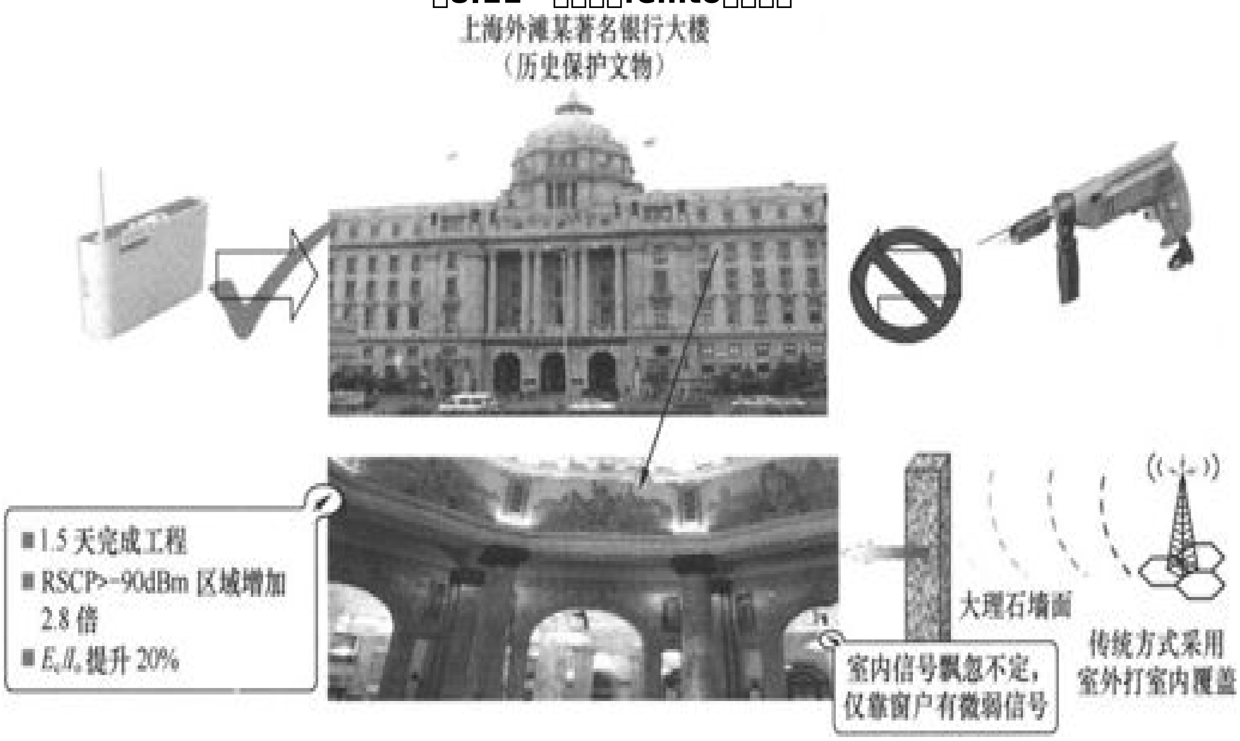
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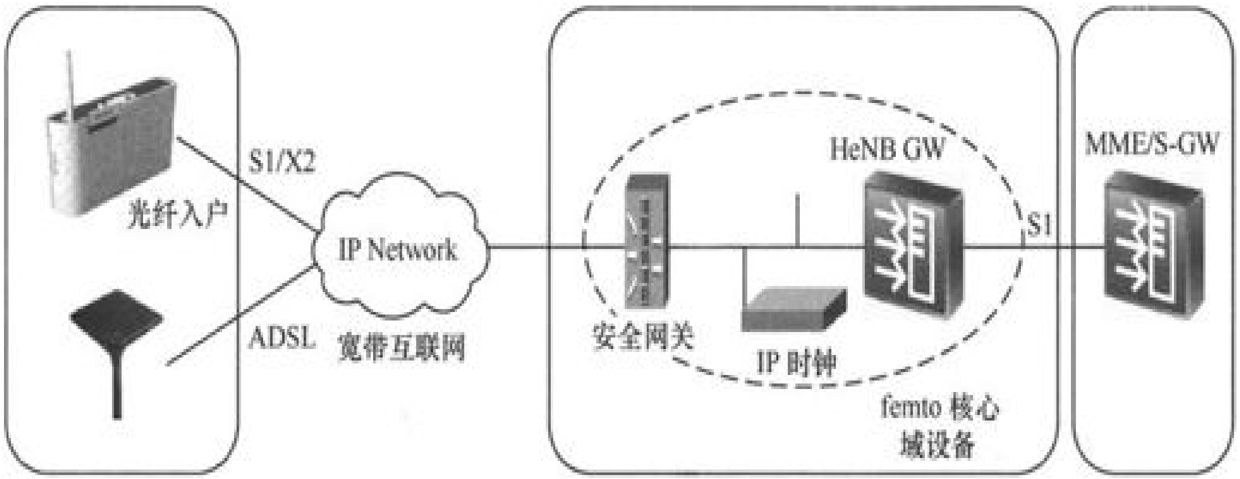
□8.11   □□□□femto□□□□



□8.12   □□□□□□□□□□femto□□

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□8.13　femto□□□□

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8.2.5　□□□□□□□□□——SON□□

□□□□□□□□2G□3G□LTE□□□□□□□□□□□□□□□□□□LTE-Advanced□□□□□□□□2G□3G□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□femto□□□□□□□□□□□□

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□□3G□□

□ □ □ □ □ □ □ □ 3GPP □ □ □ □ □ □ □ □ □ □ SON, Self-Organizing Network□□□□□LTE□LTE-Advanced□□□□□□4□□□□□□□□□

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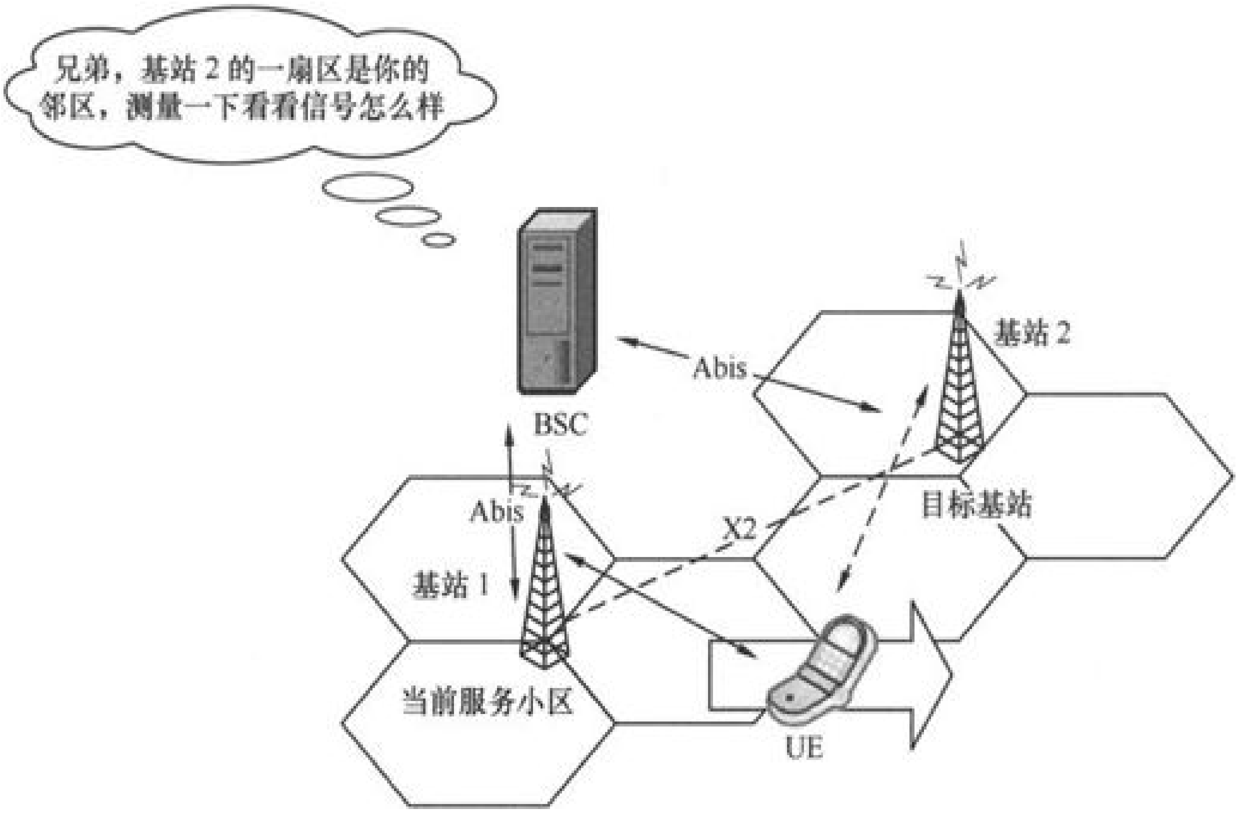
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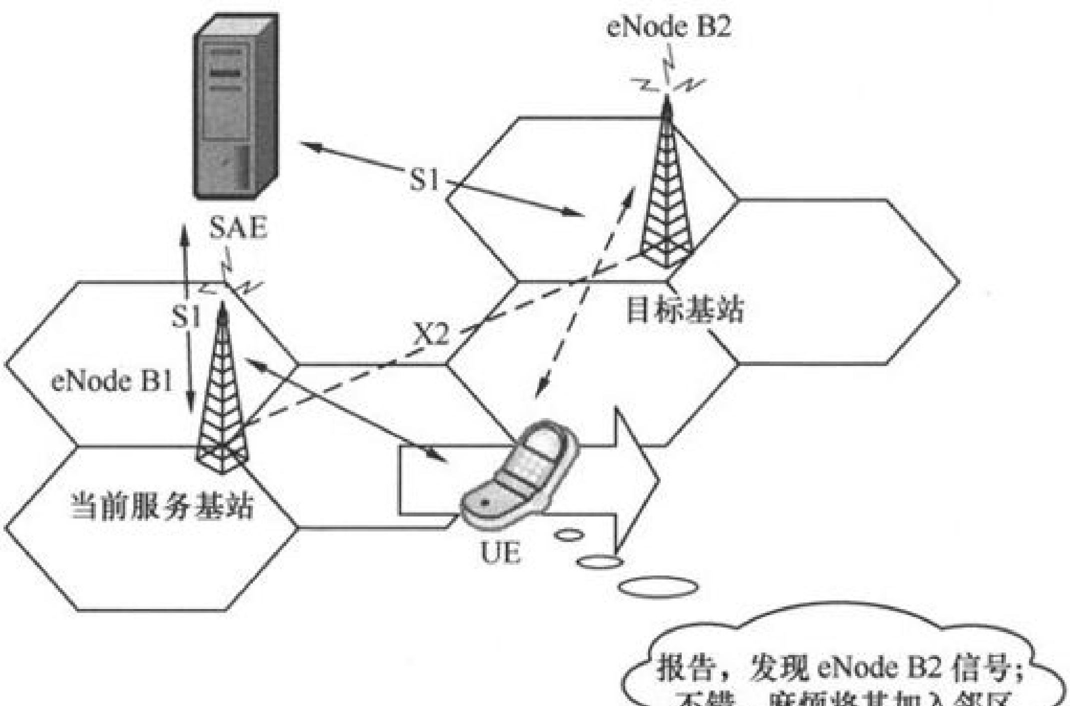
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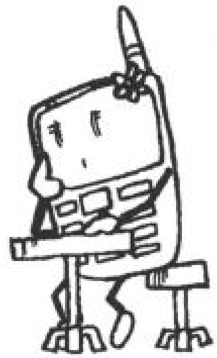


□8.15 LTE-Advanced□□ANR

SON□□□□□□□□ANR□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

[illegible]LTE-Advanced[illegible]LTE-Advanced[illegible]1Gbit/s[illegible]500Mbit/s[illegible]LTE-Advanced[illegible]LTE-Advanced[illegible]LTE-Advanced[illegible]LTE-Advanced[illegible]LTE-Advanced[illegible]Relay[illegible]RRU[illegible]femto[illegible]LTE-Advanced[illegible]SON[illegible]

□9□
Chapter 9
□□□□□□□□——3GPP



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3GPP□3GPP2□□□R4□R5□R6□…□R9□R10□□□□□□□□□□□□□□□□□□□□□□□□WCDMA□□□□□□□□□□□“□□□□□□”□□

□□IT□□IEEE□□□□□□□□□□□□□□□3GPP□3GPP2□□□TD-SCDMA□□□□□□□□□□□□□3GPP□□□□□□□□□□

9.1 3GPP□□□□

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□□□□□□□□□□□□ETSI□European Telecommunicaitons Standards Institute□□□□ARIB□Association of Radio Industries and Businesses□□□□□□□□□□□□TTC□Telecommunicaiton Technology Committee□□□□□□□□□□□□□CCSA□China Communications Standards Association□□□□□□□□□□ATIS□The Alliance for Telecommunications Industry Solutions□□□□□□□□□□□□□□□□□□□CWTS□□1996□6□□□□3GPP□3GPP□□□□LOGO□□9.1□□□□□□□□□□□□□□

3GPP□□□□□□□□□□□GSM□□□□□□□□□□□□□□□□□□□□GSM□□□□□□□□UMTS□□□□□□□□10□□□□□□□□□□□□GSM□□□□□□□□□□□□□□GPRS□EDGE□□UMTS□□□□□□WCDMA□TD-SCDMA□□□□□□□□□□HSDPA□HSUPA□HSPA+□□□□□WiMAX□□□□□□□□□□□□□□□□□□□LTE□□□□2G□□□3G□□□3GPP□□□□□□□□□□□□LTE□□□□□4G□□□3GPP□□□□□□□□□□□□□□□□□□□□“Long Term Evolution”□□□□□□□□□□□□□□□□

□9.1 3GPP□LOGO

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9.2 3GPP□□□□□□

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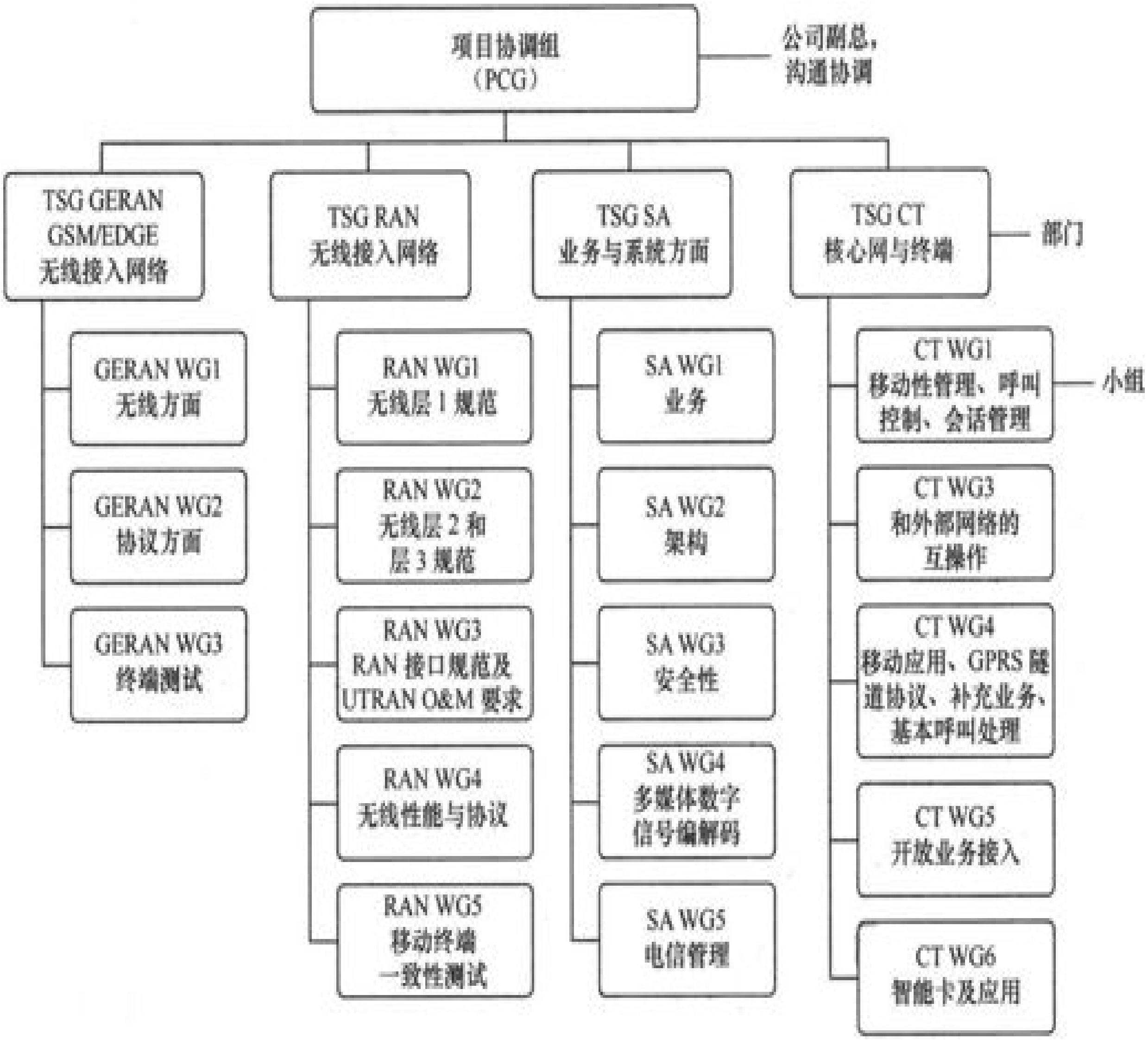
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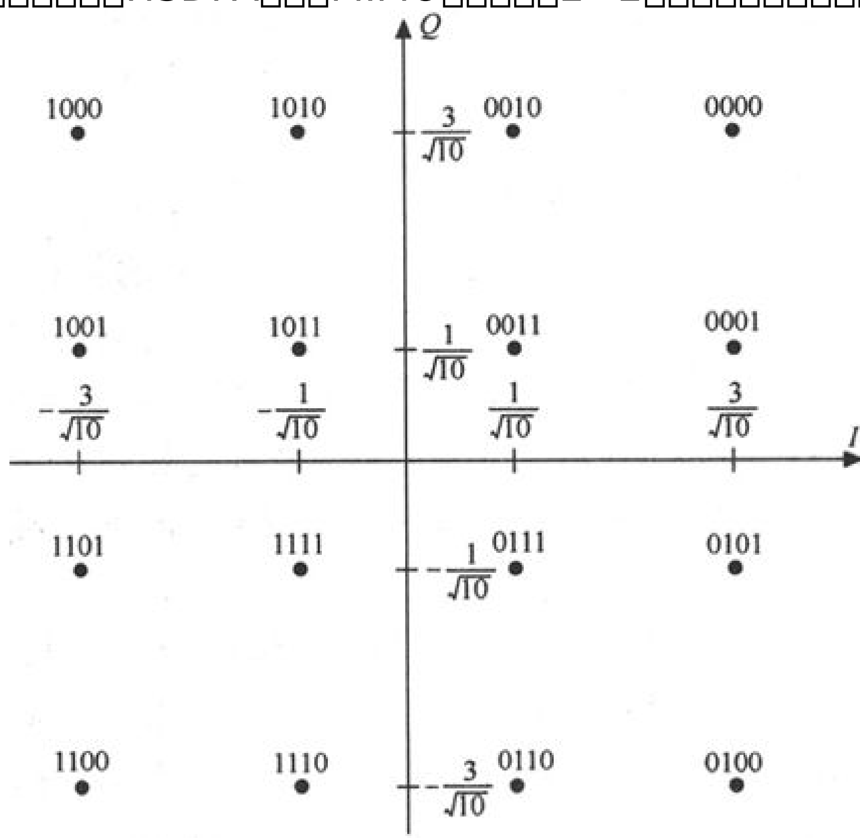
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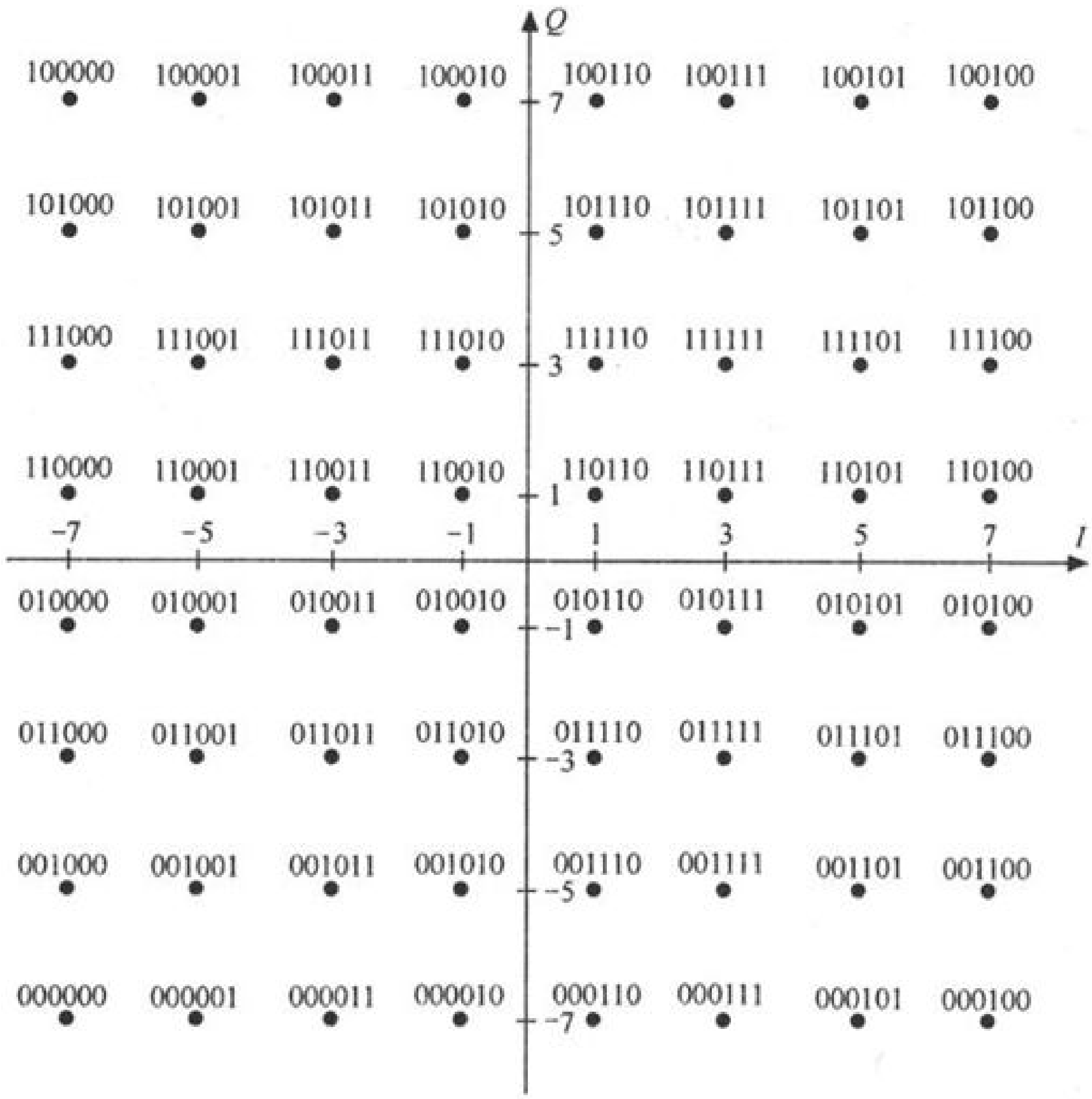
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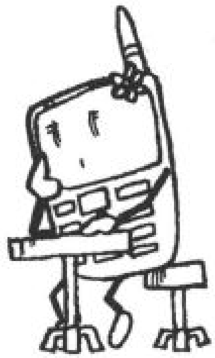
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Chapter 10



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[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

10.1 [illegible]——[illegible]

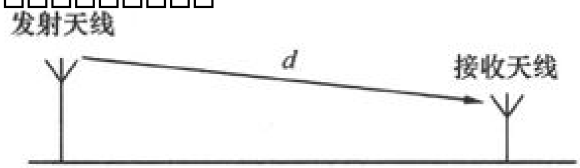
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[illegible]1000[illegible]1000[illegible]

[illegible]500[illegible]10[illegible]

[illegible]“[illegible]”[illegible]Oh My God[illegible]

[illegible]N[illegible]N[illegible]



[illegible]10.1 [illegible]

[illegible]“[illegible]”[illegible]10.1[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]

$$P_r = \frac{P_t G_t G_r \lambda^2}{(4\pi)^2 d^2} \qquad (10.1)$$

[illegible]P_t[illegible]P_r[illegible]G_t[illegible]G_r[illegible]λ[illegible]d[illegible]

[illegible]

□□□□□□□□□□□□□□□□□□□□□□□□□□□□ $\frac{P_t}{P_r}$ □□□□□□□□□□□
L□□□10.2□□□□□□□□□□□□10.1□□□□□□□

$$L=\left(\frac{4\pi d}{\lambda}\right)^2 \qquad (10.2)$$

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$$L=32.45+20\lg f+20\lg d \qquad (10.3)$$

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□□900MHz□6□dB□□□□□□□□□□□□□□1800MHz□□□□□□□□□
900MHz□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
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□□□□□□□□□□□□□□□Okumura□□□10.4□□□□□□□□□□□□□□
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$$L_{50}=L_F+A_{mu}(f,d)-G(h_{te})-G(h_{re})-G_{AREA} \qquad (10.4)$$

□□□10.4□□□L_{50}□□□□□50□□□□□□□L_F□□□□□□□□□□□
A_{mu}□f□d□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
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10.2□□□

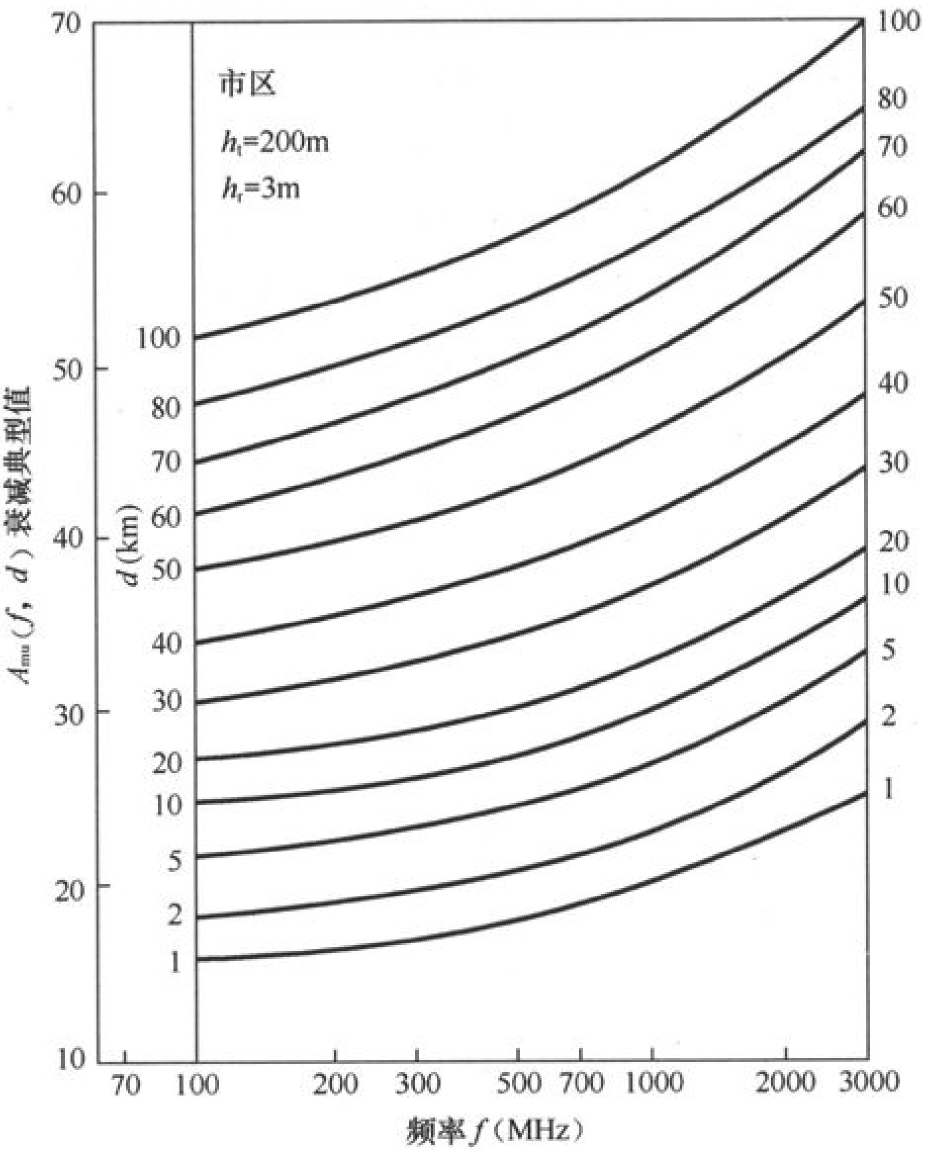


图10.2 [illegible]

[illegible]A_{mu}[illegible]f[illegible]d[illegible]d[illegible]f[illegible]Okumura[illegible]d[illegible]f[illegible]1800MHz[illegible]900MHz[illegible]

[illegible]10.4[illegible]G[illegible]h_{te}[illegible]G[illegible]h_{re}[illegible]G_{AREA}[illegible]G_{AREA}[illegible]G[illegible]h_{te}[illegible]G[illegible]h_{re}[illegible]10.5[illegible]10.7[illegible]

$$G(h_{te})=20\log\left(\frac{h_{te}}{200}\right)\qquad 1000\text{m}>h_{te}>30\text{m}\qquad(10.5)$$

$$G(h_{re})=10\log\left(\frac{h_{re}}{3}\right)\qquad h_{re}\leqslant 3\text{m}\qquad(10.6)$$

$$G(h_{re})=20\log\left(\frac{h_{re}}{3}\right)\qquad 10\text{m}>h_{re}>3\text{m}\qquad(10.7)$$

[illegible]

[illegible]“[illegible]”[illegible]N[illegible]Okumura[illegible]

[illegible]

[illegible]1[illegible]10.1[illegible]P_t[illegible]P_r[illegible]GSM[illegible]60W[illegible]GSM[illegible]20W[illegible]WCDMA[illegible]40W[illegible]WCDMA[illegible]20W[illegible]

[illegible]2[illegible]10.2[illegible]L[illegible]d[illegible]

[illegible]3[illegible]10.4[illegible]10.5[illegible]

[illegible]4[illegible]10.6[illegible]10.7[illegible]2[illegible]10.7[illegible]10.6[illegible]3m[illegible]

[illegible]4[illegible]GSM1800M[illegible]GSM900[illegible]

[illegible]

10.2 [illegible]——[illegible]CQT[illegible]

[illegible]

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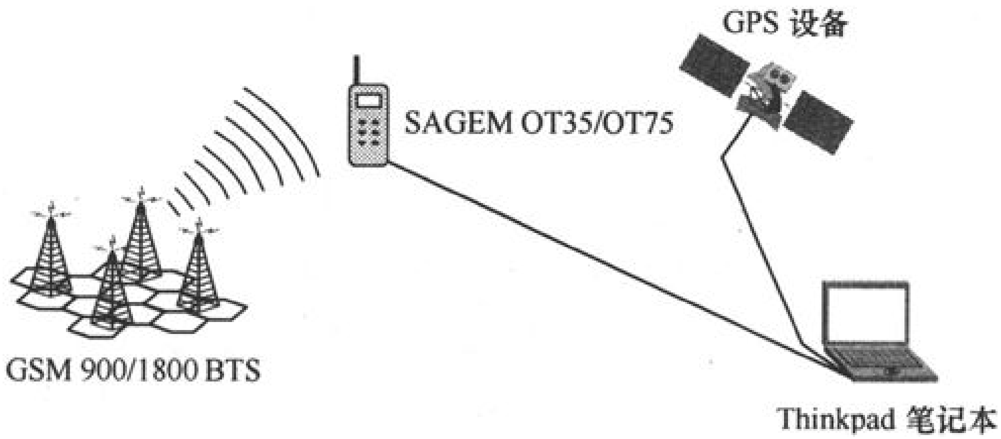
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DT[illegible]

[illegible]GPS[illegible]

“[illegible]”[illegible]“[illegible]”[illegible]“GPS”[illegible]“[illegible]”——IBM Thinkpad[illegible]10.3[illegible]



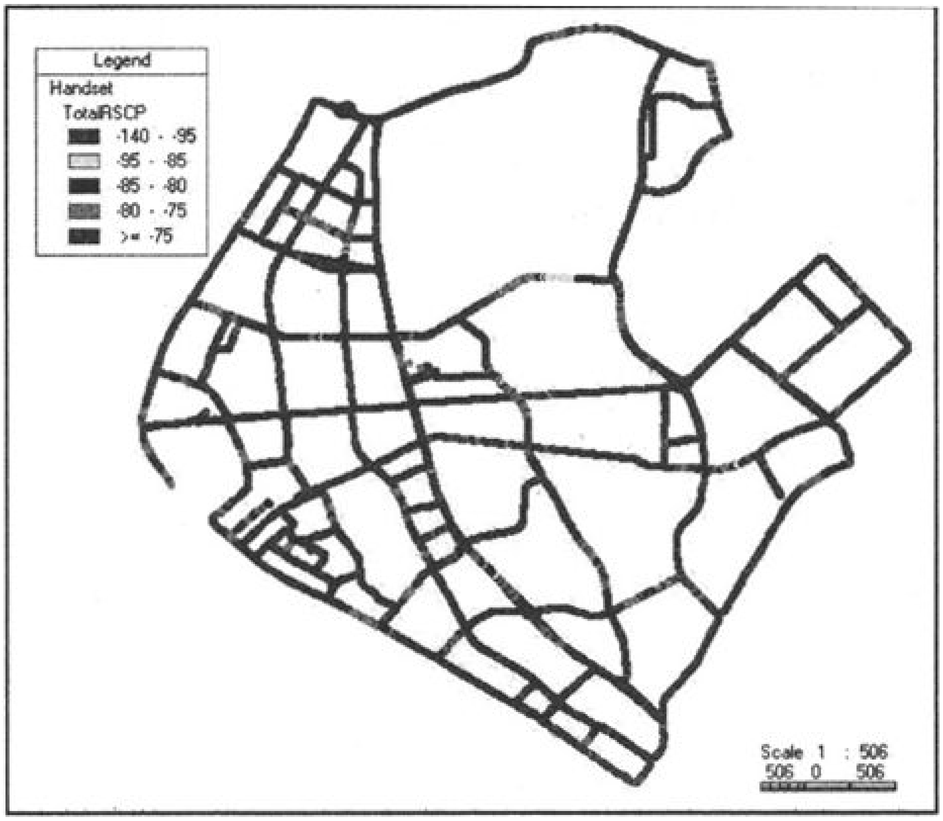
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[illegible]10.4 [illegible]

[illegible]VIP[illegible]CQT[illegible]DT[illegible]

[illegible]CQT[illegible]DT[illegible]DT[illegible]CQT[illegible]DT[illegible]

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[illegible]DT[illegible]CQT[illegible]10.4[illegible]DT[illegible]CQT[illegible]

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[illegible]CQT[illegible]

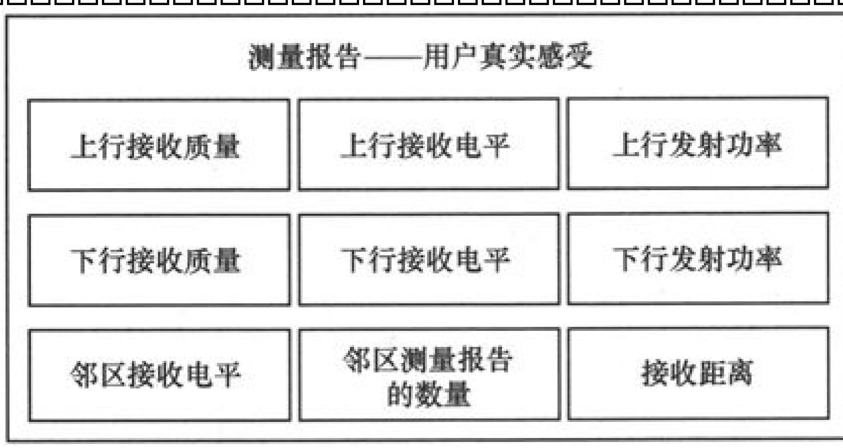
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[illegible]10.5[illegible]

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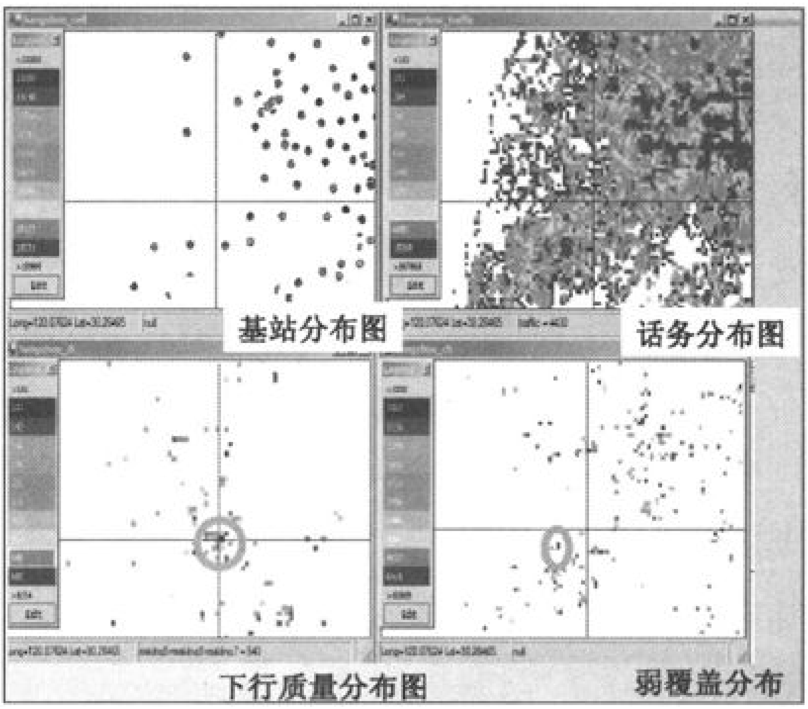
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[illegible]BSC[illegible]

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□GPS□□□□□□



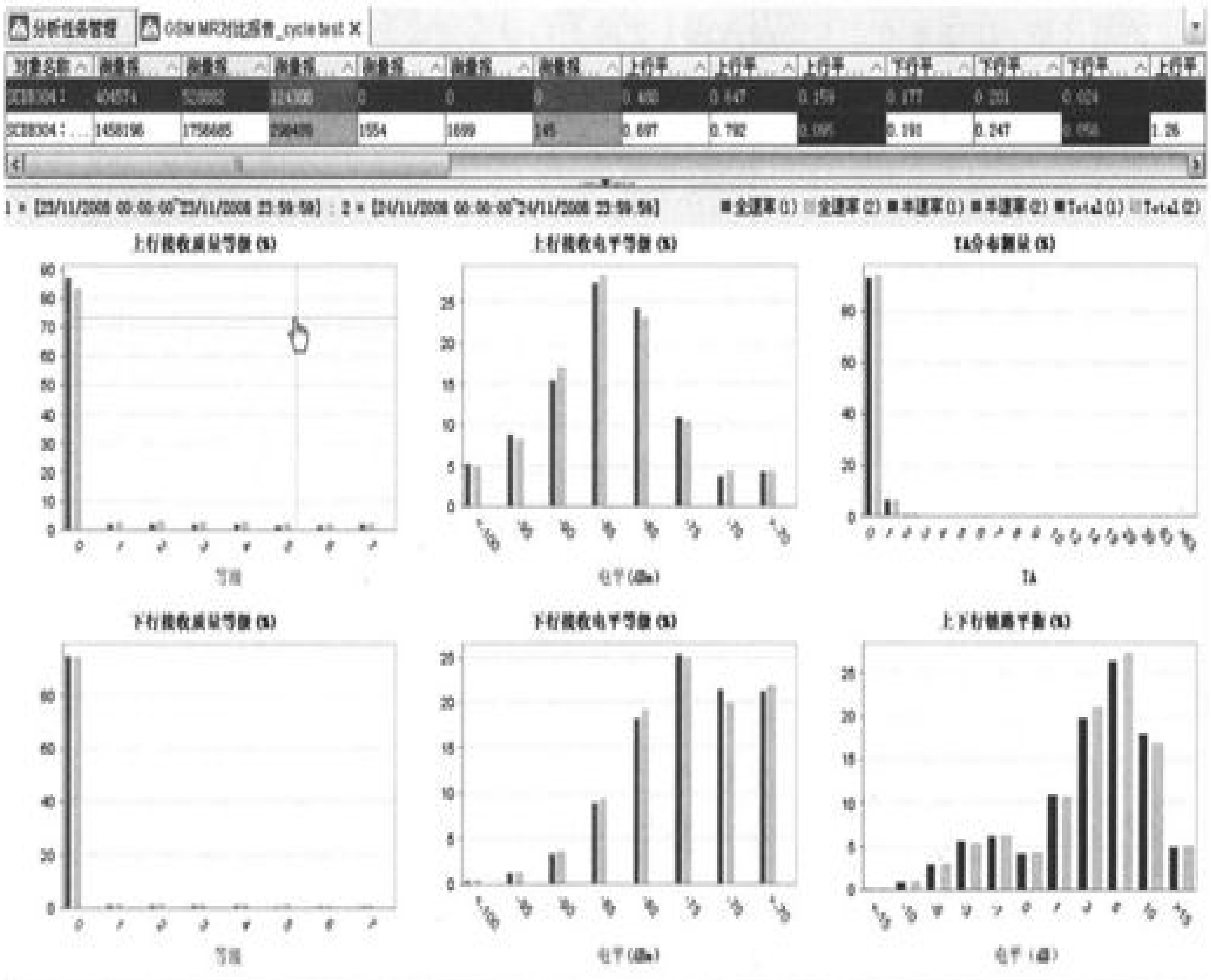
□10.6　MR□□

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□□□□□□□□□□□10.6□

□□10.6□□□□MR□□□□□□□□□□□□□□□□□□□□□□□□□□□
GPS□□□□□□□□□□□□□□□□□□□□□□□□□□□□□10.6□□□□□
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□□□□□□□□□MR□□□GPS□□□□□10.5□□□“□□□”□□□□□

[illegible]10.5[illegible]GSM[illegible]GSM[illegible]BSC[illegible]“TA[illegible]Time Advance[illegible]”[illegible]bit[illegible]550[illegible]

[illegible]MR[illegible]10.7[illegible]MR[illegible]10.7[illegible]



[illegible]10.7 MR[illegible]

[illegible]“[illegible]GPS[illegible]GPS[illegible]……”[illegible]GPS[illegible]GPS[illegible]

10.4 [illegible]——[illegible]

[illegible]Excel[illegible]KPI[illegible]

10.4.1 [illegible]——[illegible]

[illegible]KPI[illegible]KPI[illegible]8[illegible]10[illegible]

[illegible]1[illegible]

[illegible]“[illegible]”[illegible]“G3[illegible]”[illegible]“WO[illegible]”[illegible]“[illegible]”[illegible]

[illegible]

[illegible]2[illegible]

[illegible]

[illegible]3[illegible]

[illegible]

[illegible]4[illegible]

[illegible]

10.4.2 [illegible]——[illegible]

[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]1[illegible]

[illegible]LAC[illegible]LAC[illegible]LAC[illegible]

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[illegible]

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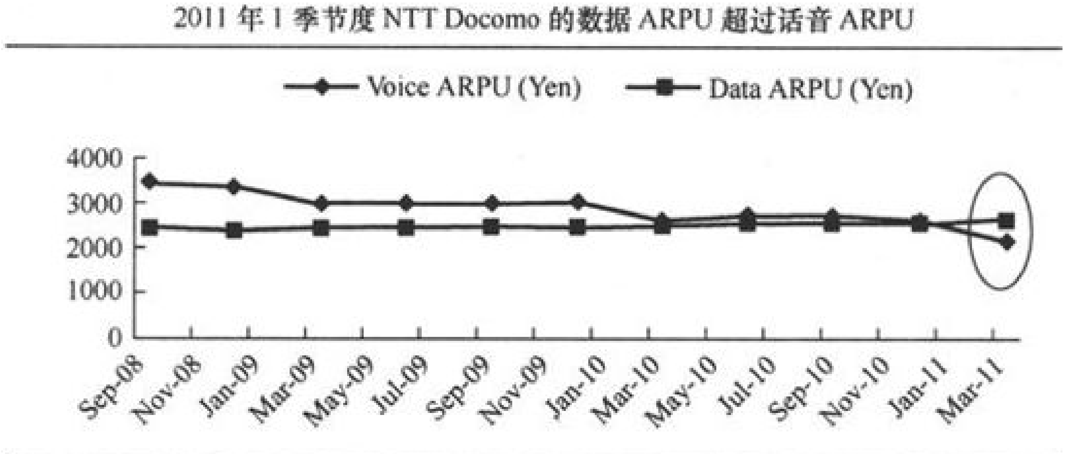
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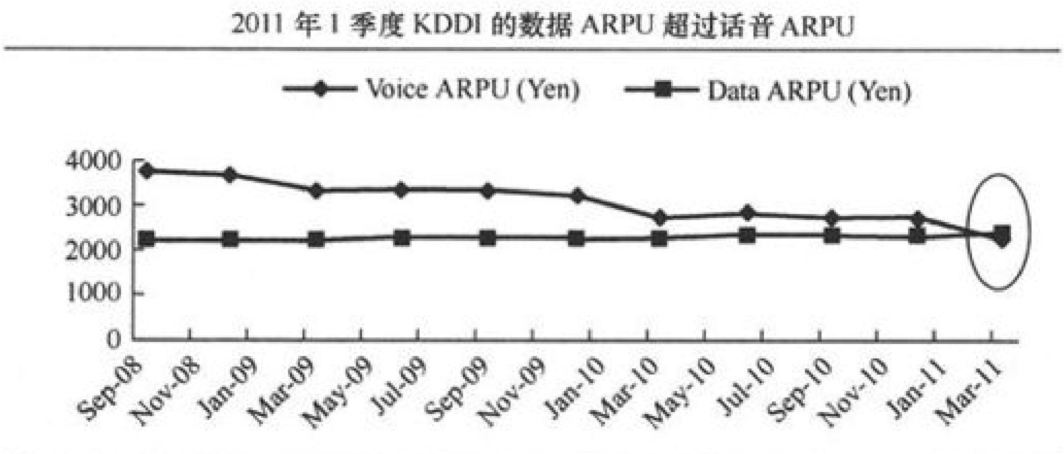
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[illegible]3G[illegible]2010[illegible]KPI[illegible]NTT[illegible]KDDI[illegible]KPI[illegible]3G[illegible]





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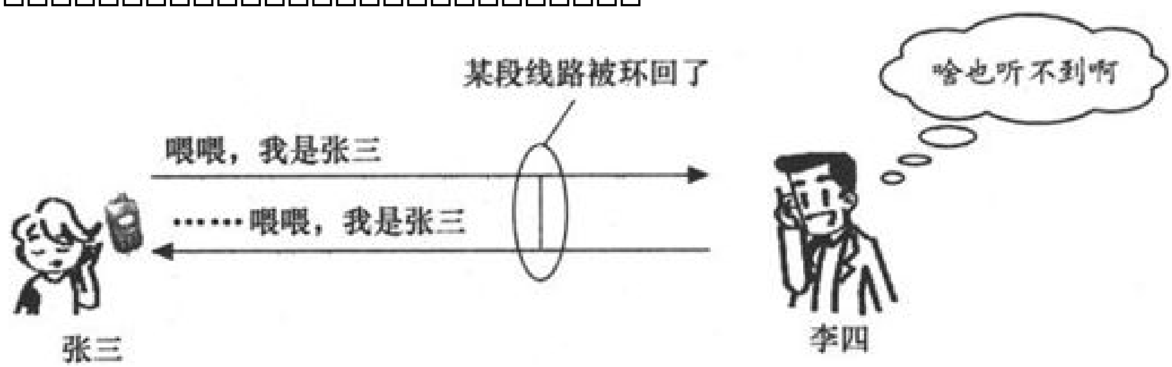
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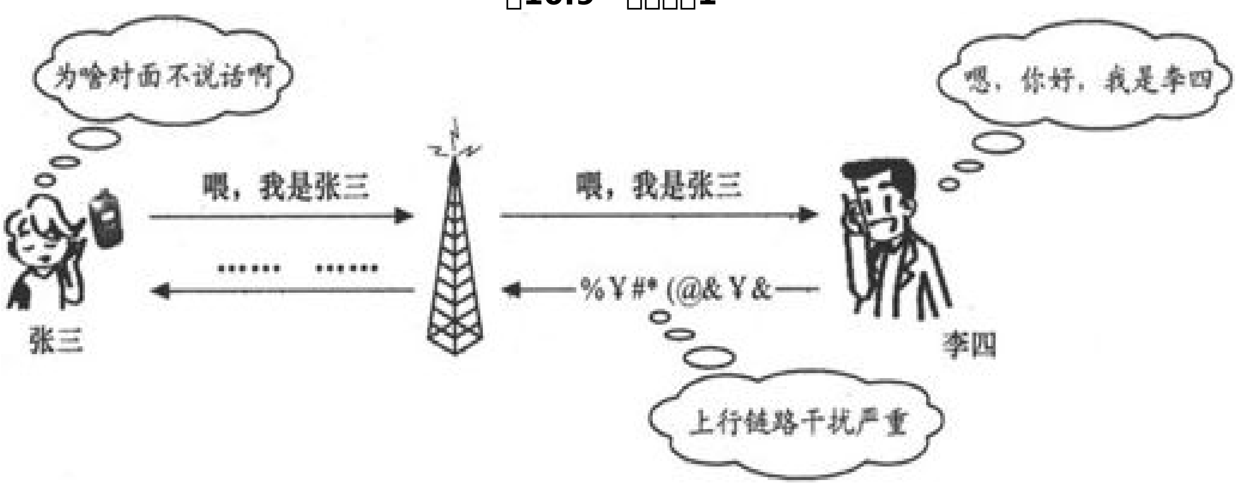
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[illegible]10.9[illegible]10.10[illegible]10.9[illegible]10.10[illegible]



□10.9 □□□□1



□10.10 □□□□2

[illegible]MSC[illegible]

[illegible]N[illegible]

[illegible]

[illegible]DT[illegible]CQT[illegible]MR[illegible]KPI[illegible]

[illegible]
Afterword

[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]GSM[illegible]WCDMA[illegible]LTE[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]

[illegible]
Acronyms

2FSK	Binary Frequency Shift Keying	[illegible]
3G	3rd-generation	[illegible]
3GPP	The 3rd Generation Partnership Project	[illegible]
3GPP2	The 3rd Generation Partnership Project2	[illegible]2
AAA	Authentication[illegible]Authorization[illegible]Accounting	[illegible]
ADSL	Asymmetric Digital Subscriber Line	[illegible]
AGCH	Access Grant CHannel	[illegible]
AICH	Acquisition Indication CHannel	[illegible]
AM	Amplitude Modulation	[illegible]
AM	Acknowledged Mode	[illegible]
AMC	Adaptive Modulation and Coding	[illegible]
AMPS	Advanced Mobile Phone System	[illegible]
ANR	Automatic Neighbour Relation	[illegible]
ANRF	Automatic Neighbour Relation Function	[illegible]
ARIB	Association of Radio Industries and Business	[illegible]
ARPU	Average Revenue Per User	[illegible]
ARQ	Automatic Retransmission reQuest	[illegible]
ASCII	American Standard Code for Information Interchange	[illegible]

ASK	Amplitude Shift Keying	□□□□
AT&T	American Telephone & Telegraph	□□□□□□□□
ATIS	The Alliance for Telecommunications Industry Solutions	□□□□□□□□□□
AuC	Authentication Center	□□□□
B3G	Beyond 3G	□3G
BBU	BaseBand Unit	□□□□
BCCH	Broadcast Control CHannel	□□□□□□
BLAST	Bell Labs Layer Space Time	□□□□□□□□□□□
BPSK	Binary Phase Shift Keying	□□□□□□
BSC	Base Station Controller	□□□□□
BSIC	Base Station Identity Code	□□□□□
BT	British Telecom	□□□□
BTS	Base Transceiver Station	□□□□□
BWA	Broadband Wireless Access	□□□□□□□□□□□
CA	Carrier Aggregation	□□□□
CAPEX	Capital Expenditure	□□□□□□□□□□
CB	Coordinated Beamforming	□□□□
CC	Country Code	□□□
CCCH	Common Control CHannel	□□□□□□
CCSA	China Communications Standards Association	□□□□□□□□
CDMA	Code Division Multiple Access	□□□□
cdma2000	Code Division Multiple Access 2000	□□3G□□□□□□
CGI	Cell Global Identifier	□□□□□□□
CMMB	China Mobile Multimedia Broadcasting	□□□□□□□□□
CoMP	Coordinated Multi-Point	□□□□

CP	Cyclic Prefix	[illegible]
CPICH	Common PIlot CHannel	[illegible]
CPU	Central Processing Unit	[illegible]
CQT	Call Quality Test	[illegible]
CRC	Cyclical Redundancy Check	[illegible]
CS	Coordinated Scheduling	[illegible]
CT	Communication Technology	[illegible]
CTCH	Common Traffic CHannel	[illegible]
CTIA	Cellular Telecommunications Industry Association	[illegible]
CWTS	China Wireless Telecommunications Standards group	[illegible]
DAB	Digital Audio Broadcasting	[illegible]
DCA	Dynamic Channel Allocation	[illegible]
DCCH	Dedicated Control CHannel	[illegible]
DCS	Dynamic Cell Selection	[illegible]
DPCCH	Dedicated Physical Control CHannel	[illegible]
DPCM	Differential Pulse Code Modulation	[illegible]
DPDCH	Dedicated Physical Data CHannel	[illegible]
DRX	Discontinuous Reception	[illegible]
DSP	Digital Signal Processor	[illegible]
DT	Driver Test	[illegible]
DTCH	Dedicated Traffic CHannel	[illegible]
DTX	Discontinuous Transimission	[illegible]
DVB	Digital Video Broadcasting	[illegible]

DwPTS	Downlink Pilot Time Slot	□□□□□□
EDGE	Enhanced Data Rate for GSM Evolution	□□□□□□□GSM□□□□
E-DPDCH	Enhanced Dedicated Physical Data CHannel	□□□□□□□□□□□
EPC	Evolved Packet Core	□□□□□□□□
EPS	Evolved Packet System	□□□□□□
ETSI	European Telecommunications Standards Institute	□□□□□□□□
E-UTRAN	Evolved-UTRAN	□□□UMTS□□□□□□□
FCC	Federal Communications Commission	□□□□□□□
FCCH	Frequency Correction CHannel	□□□□□□
FDM	Frequency Division Mutiplexing	□□□□
FDMA	Frequency Division Multiple Access	□□□□
FPLMTS	Future Public Land Mobile Telecommunication System	□□□□□□□□□□□□
FSK	Frequency Shift Keying	□□□□
GBR	Guranteed Bit Rate	□□□□□
GGSN	Gateway GPRS Support Node	□□GPRS□□□□
GMSK	Gaussian filtered Minimum Shift Keying	□□□□□□□□□□
GP	Guard Period	□□□□
GPRS	General Packet Radio Service	□□□□□□□□□□
GPS	Global Positioning System	□□□□□□
GSM	Global System of Mobile communication	□□□□□

		[illegible]
HDTV	High Definition Television	[illegible]
HLR	Home Location Register	[illegible]
HSDPA	High Speed Downlink Packet Access	[illegible]
HS-DSCH	High-Speed Downlink Shared CHannel	[illegible]
HSPA	High Speed Uplink Packet Access	[illegible]
HSPA+	HSPA Evolution	[illegible] HSPA
HSUPA	High Speed Uplink Packet Access	[illegible]
IC	Interference Cancellation	[illegible]
ICI	Inter-Carrier Interference	[illegible]
IEEE	Institute of Electrical and Electronics Engineers	[illegible]
IMEI	International Mobile Equipment Identity	[illegible]
IMS	IP Multimedia Subsystem	IP[illegible]
IMSI	International Mobile Subscriber Identification	[illegible]
IMT-2000	International Mobile Telecom System-2000	[illegible]-2000
IMT-Advanced	International Mobile Telecommunication-Advanced	[illegible]
IP	Internet Protocol	[illegible]
IPR	Intellectual Property Right	[illegible]
IS-95	Interim Standard-95	[illegible] CDMA

		□□□□□□
ISI	Inter Symbol Interference	□□□□
IT	Information Technology	□□□□□□
ITU	International Telecommunications Union	□□□□□□
JD	Joint Detection	□□□□
JP	Joint Processing	□□□□
JT	Joint Transmission	□□□□
LAC	Location Area Code	□□□□
LAI	Location Area Identity	□□□□□□
LCR TDD	Low Code Rate TDD	□□□□□TDD□□
LoS	Line-of-Sight	□□
LTE	Long Term Evolution	□□□□
MAC	Media Access Control	□□□□□□
MAI	Multi-Address Interference	□□□□
MBMS	Multimedia Broadcast Multicast Service	□□□□□□□□□□
MCC	Mobile Country Code	□□□□□□
MGW	Media GateWay	□□□□
MI	Mobile Internet	□□□□□
MIMO	Multi Input Multi Output	□□□□□□□□
MME	Mobility Management Entity	□□□□□□□
MNC	Mobile Network Code	□□□□
MQAM	Multiple Quadrature Amplitude Modulation	□□□□□□□□□
MR	Measure Report	□□□□
MSC	Mobile Switching Center	□□□□□□
MSIN	Mobile Station Identity Number	□□□□□□□
MSISDN	Mobile Subscriber International ISDN/PSTN Number	□□□□□

		[illegible]
MSK	Minimum Shift Keying	[illegible]
MSRN	Mobile Station Roaming Number	[illegible]
MUD	Multi-User Detection	[illegible]
MW	Medium Wave	[illegible]
NDC	National Destionation Code	[illegible]
NTT	Nippon Telegraph & Telephone	[illegible]
OFDM	Orthogonal Frequency Division Multiplexing	[illegible]
OPEX	Operating Expense	[illegible]
OSI	Open System Interconnect	[illegible]
OVSF	Orthogonal Variable Spreading Factor	[illegible]
PACCH	Packet Asscrchted Control CHannel	[illegible]
PAGCH	Packet Access Grant CHannel	[illegible]
PAPR	Peak to Average Power Ratio	[illegible]
PBCCH	Packet Broadcast Control CHannel	[illegible]
PBCH	Physical Broadcast CHannel	[illegible]
PCCCH	Packet Common Control CHannel	[illegible]
P-CCPCH	Primary Common Control Physical CHannel	[illegible]
PCF	Packet Control Function	[illegible]
PCG	Project Co-ordination Group	[illegible]
PCH	Paging CHannel	[illegible]
PCM	Pulse Code Modulation	[illegible]
PCRF	Policy and Charging Rules Funciton	[illegible]

PCS	Personal Communications Service	□□□□□□
PCU	Package Control Unit	□□□□□□
PDSCH	Physical Downlink Shared CHannel	□□□□□□□□
PDSN	Packet Data Serving Node	□□□□□□□□
PDTCH	Packet Data Traffic CHannel	□□□□□□□□
PDU	Protocol Data Unit	□□□□□□
P-GW	PDN GateWay	PDN□□
PHS	Personal Handy-phone System	□□□□□□□□□
PICH	Paging Indicator CHannel	□□□□□□
PPCH	Packet Paging CHannel	□□□□□□
PRACH	Physical Random Access CHannel	□□□□□□□□
PSC	Primary Synchronization Code	□□□□
PSK	Phase Shift Keying	□□□□
PSS	Primary Synchronizaiton Signal	□□□□□
QAM	Quadrature Amplitude Modulation	□□□□□□
QoS	Quality of Service	□□□□
QPSK	Quadrature Phase Shift Keying	□□□□□
RACH	Random Access CHannel	□□□□□□
RAN	Radio Acess Network	□□□□□
RB	Resource Block	□□□
RC	Radio Configuration	□□□□
RE	Resource Element	□□□□
RLC	Radio Link Control	□□□□□□
RNC	Radio Network Controller	□□□□□□□
RRC	Radio Resource Control	□□□□□

		□
RRU	Radio Remote Unit	□□□□□□
RS	Relay Station	□□□
SACCH	Slow Associated Control CHannel	□□□□□□□□
SAE	System Architecture Evolution	□□□□□□
S-CCPCH	Secondary Common Control Physical CHannel	□□□□□□□□□□
SCH	Synchronization CHannel	□□□□
SDCCH	Stand-alone Dedicated Control CHanne	□□□□□□□
SDM	Space Division Multiplexing	□□□□
SDMA	Space Division Mutiple Access	□□□□
SFN	System Frame Number	□□□□
SGSN	Servicing GPRS Support Node	GPRS□□□□□□
S-GW	Serving GateWay	□□□□
SIM	Subscriber Identity Module	□□□□□□□□
SIR	Signal to Interference Ratio	□□□□□□□□
SN	Subcriber Number	□□□□
SNR	Signal-to-Noise Ratio	□□□
SNS	Social Network Site	□□□□
SON	Self-Organizing Network	□□□□□
SSC	Secondary Synchronization Code	□□□□
SSS	Secondary Synchronizaiton Signal	□□□□□
SUD	Single-User Detection	□□□□□
TA	Time Advance	□□□□□
TCH	Traffic CHannel	□□□□
TDM	Time Division Multiplexing	□□□□
TDMA	Time Division Multiple Access	□□□□
TD-SCDMA	Time Division-Synchronous Code Division Multiple Access	□□□□□□□□
Telefonica	Telefónica of Spain	□□□□□□□

TIA	Telecommunication Industry Association	□□□□□□□□
TM	Transparent Mode	□□□□
TMSI	Temporary Mobile Subscriber Identity	□□□□□
TSG	Technical Specification Group	□□□□□
TTA	Telecommunication Technique Association	□□□□□□□□□□
TTI	Transmission Time Interval	□□□□□□
UM	Unacknowledged Mode	□□□□□
UMB	Ultra Mobile Broadband	□□□□□
UMTS	Universal Mobile Telecommunications System	□□□□□□□□
UpPTS	Uplink Pilot Time Slot	□□□□□□
UTRAN	UMTS Terrestrial Radio Access Network	UMTS□□□□□□□
VAD	Voice Activity Detection	□□□□□□
VLR	Visitor Location Register	□□□□□□□
WCDMA	Wideband Code Division Multiple Access	□□□□□□
WG	Work Group	□□□
Wi-Fi	Wireless Fidelity	□□□□□□□□□□□
WiMAX	Worldwide interoperability for Microwave Access	□□□□□□□□
WLAN	Wireless Local Area Networks	□□□□□

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